

POPULAR
MECHANICS

MAGAZINE

WRITTEN BY MEN WHO KNOW HOW TO USE AND IT

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Three-Eyed Camera
Page 120

Fifty Years of Exploration
By **LOWELL THOMAS**

The Owners Report on the
DE SOTO

For the Home Owner



Illustrated above: Commander V-8 Starliner.

White sidewall tires and chrome wheel discs optional at extra cost.

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See Studebaker for '52

Studebaker, South Bend 27, Indiana, U. S. A.



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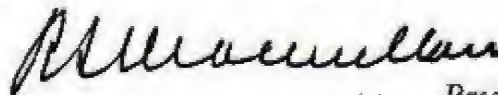
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this month's cover

RACY OUTBOARDS roar up ramps to leap across our cover and zoom full speed toward a strange, turreted mechanism. Actually it's three movie cameras mounted as a single unit, with the three lenses aimed so they cover the entire field of human vision. Later the three films will be projected simultaneously on a huge "wrap around" screen, a curved surface three times as wide and half again as high as a conventional screen. As a viewer you'll find yourself actually in the middle of the lake and far off to the right you'll spot the outboards. They'll angle across the screen toward you, leap the ramps and disappear somewhere so close over your left shoulder you may whirl around to see what's happening. The technique is called Cinerama. It combines a curved screen and stereophonic sound to produce a three-dimension spectacle of amazing reality. You'll find details on page 120

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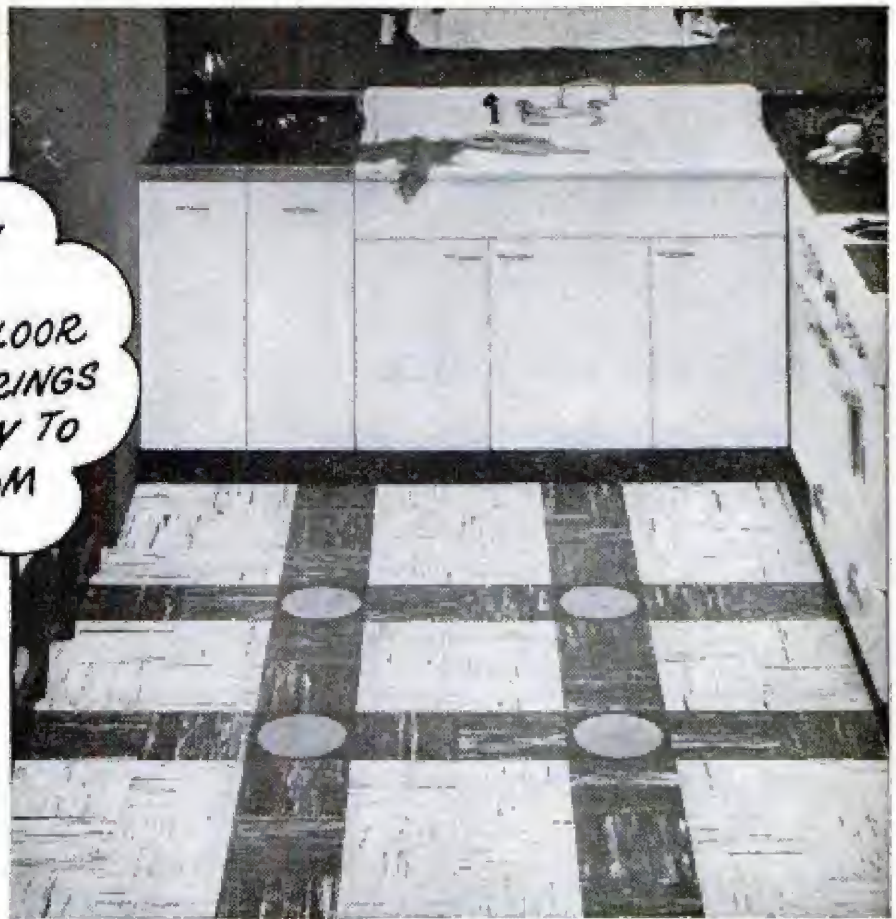
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POPULAR MECHANICS

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THE EDITORS



Most Popular Mechanic Is Pop!

We don't often break into poetry. But here's a verse by Hilda Butler Farr that appeared not long ago on the sports page of the Chicago Tribune in Arch Ward's column, "In the Wake of the News":

POPular Mechanics

At anything mechanical
 I'm really quite a flop!
 And have no gifts along these lines,
 I leave it all to Pop.

The ribbon which I try to fix
 In my typewriter, too,
 Will never work the way it should
 Regardless what I do.

The car will start out beautifully
 And then . . . decide to stop:
 I've no idea what can be wrong,
 I leave it all to Pop.

I cannot fix a toaster cord
 Whatever type or brand,
 And cannot drive a nail without
 I drive it through my hand

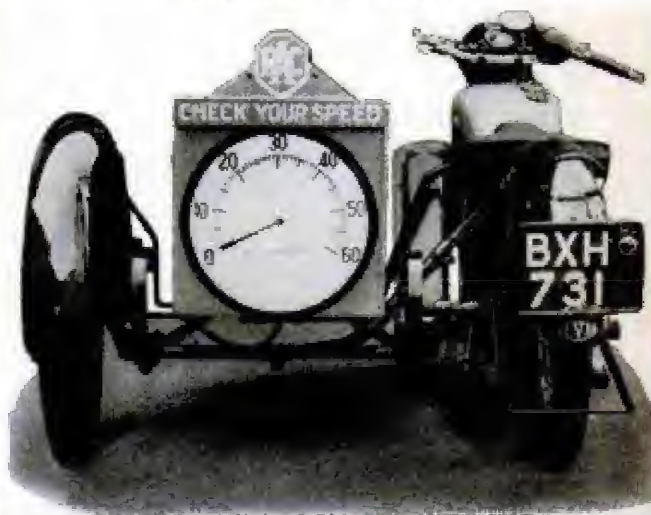
At anything mechanical
 I'm really quite a flop!
 And have no gifts along these lines . . .
 I leave it all to Pop.

Letter to the Editor:

I duly received my Golden Anniversary issue of *Popular Mechanics*. I can only describe it as a truly wonderful issue. Your standard work is splendid and I always look forward to the next issue. I cannot claim that I have been a reader for 50 years—owing to difficulty during the late war—but I can claim nearly 40.

Your article on page 231, "Drivers Check Their Speedometers With Giant Meter on

(Continued to page 8)



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TRAIN IN MIAMI - AIR CAPITAL OF THE WORLD

(Continued from page 6)

Police Car" . . . I enclose a photo of a similar arrangement that I designed and produced for the Royal Automobile Club, London. This was prepared 15 years ago when the 30-mile-per-hour limit was enforced.

I might mention I was appointed Chief Engineer to the Royal Automobile Club (R.A.C.) in 1903 and served in that capacity for 44 years. I retired in 1947.

F. W. Hudlass,
Barnes, England

Letter to the Editor:

Have just read through your 50th Anniversary issue and think it is better than anything here. . . . One notes here in England the growing number of GIs about and hopes the war clouds of Russia may drift away in the moonlight of some good American horse sense.

C.S. Potts,
Roxwell, Chelmsford, Essex

Letter to the Editor:

The accompanying photo shows the Goeltzschtalbrucke, "bridge across the Valley of Goeltzsch," which joins the towns of Reichenbach and Plauen into the so-called



Vogtland of Saxony in Germany. It is one of the few bridges which outlasted World War II. The bridge was built during the years 1846 to 1851.

To erect the viaduct, 26 million bricks were necessary. Length of the bridge is 578 meters . . . height from the river to the track is 78 meters. The cost was 6.6 million marks, of which expenses for scaffolding amounted to 300,000 marks.

In peacetime, the viaduct was crossed by 34,000 trains yearly.

Hans F. Kutschbach,
24 Huebichweg,
Bad Grund/Harz,
Germany (British Zone)

(Continued to page 10)



Picture yourself going places



You've done it often. Call it day-dreaming if you like, but you've seen yourself in a bigger job — giving orders and making decisions — driving off in a smart new car — buying your family a fine home.

There's nothing wrong with dreams. But how about making them come true? *You can do it*, if you're willing to try!

Look around you. The men who are going places are the *trained* men. They've learned

special skills that bring them better jobs and higher pay. It's the men *without* training whose dreams never come true.

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L. P. S., Elkhart, Ind.

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(Continued from page 8)

Letter to the Editor:

When the March *Popular Mechanics* reached us, I was struck by an inaccuracy in the letter accompanied with a photograph from Roy Whitehouse of San Marcos, Calif. The leaping sea beast shown is evidently not a shark. What strikes first is the shape of the tail which is not that of a selachian fish, with asymmetrical fins, but the tail of a teleosteanlike fish. The mouth also is clearly not that of a shark (whose lower jaw is receding). The lower jaw of the animal shown juts forward and the forehead is typical of that of a sea mammal similar to the porpoise.

Dr. Richard Ajy,
Guam Memorial Hospital,
Agana, Guam, Marianas Islands

Doctor Ajy knows his Teleostei. The curator of fishes at Chicago's Natural History Museum confirms that the subject appears to be a member of the porpoise family.—The Editor.

Letter to the Editor:

Just picked up the June issue of *Popular Mechanics* and saw beginning on page 136 "The Cars They Drive Are Classics."

Do you know the Classic Car Club of America was organized a few months ago for owners of cars made between 1925 and 1942, as well as those who are interested in them?

As executive director and founder of the Classic Car Club of America, I should like to report that we do not permit on the exhibition line any cars that have been hopped up or whose bodies have been altered beyond the original design. All cars must be in prime condition and fully restored before they can be placed on the line. Also, we do not discriminate against any of the smaller cars such as the Model-A Ford, Plymouth, Chevrolet, Erskine, or Rockne.

Edward A. Moran,
3629 Oxford Ave.,
Riverdale, N. Y.

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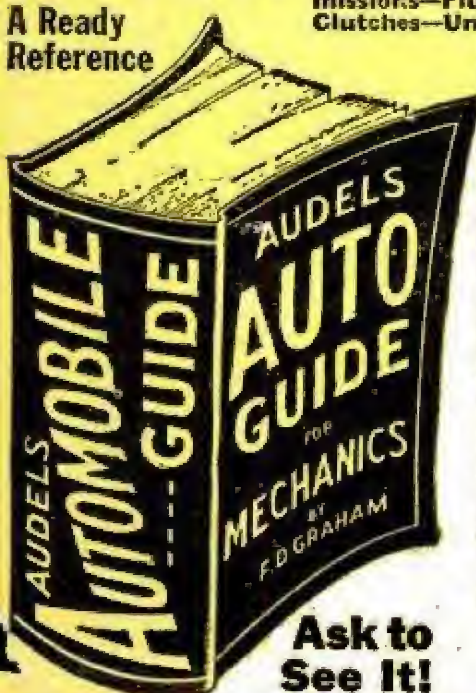
How to fit pistons—How to locate engine knocks—How to fit connecting rod bearings—How to service main bearings—How to recondition valves—How to time valves—How to adjust fan belts—How to adjust carburetors & chokes—How to rebuild a clutch—How to service automatic transmissions—How to service brakes—How to adjust steering gear—How to cope with ignition troubles—How to service distributors—How to time ignition—How to "tune up" an engine.

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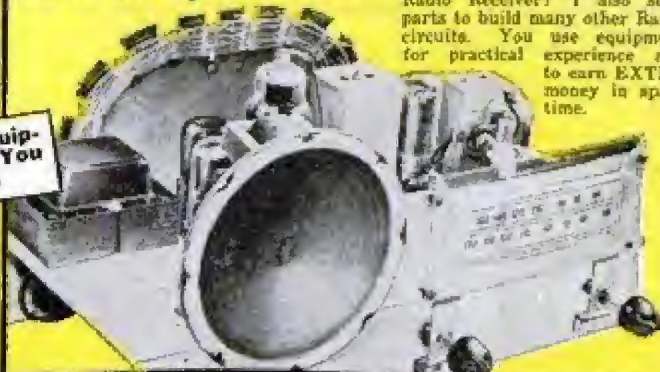


As part of my Communications Course you build this low power broadcasting transmitter, learn how to put a station "on the air," perform procedures demanded of Broadcast Station operators, make many tests.

This is just part of the equipment my students build. You keep all parts I send.

You Practice Radio SERVICING

on this modern radio you build with parts I send



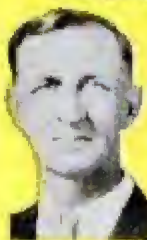
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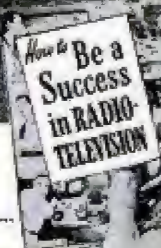
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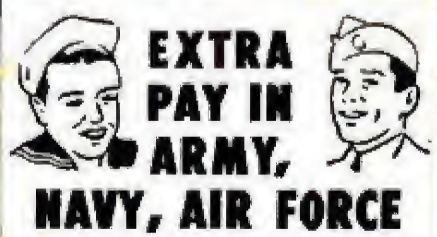
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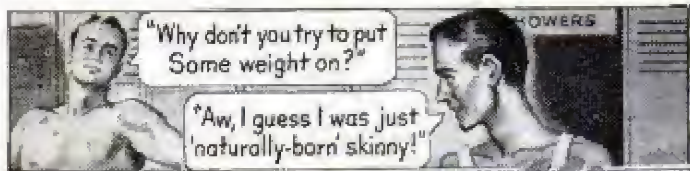
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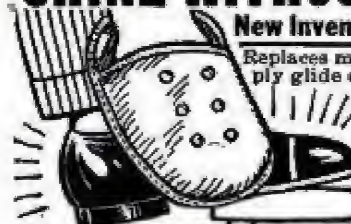
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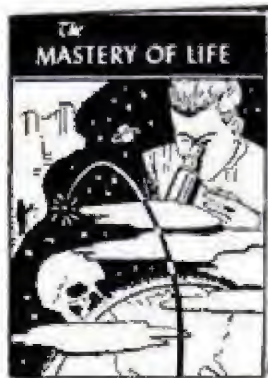
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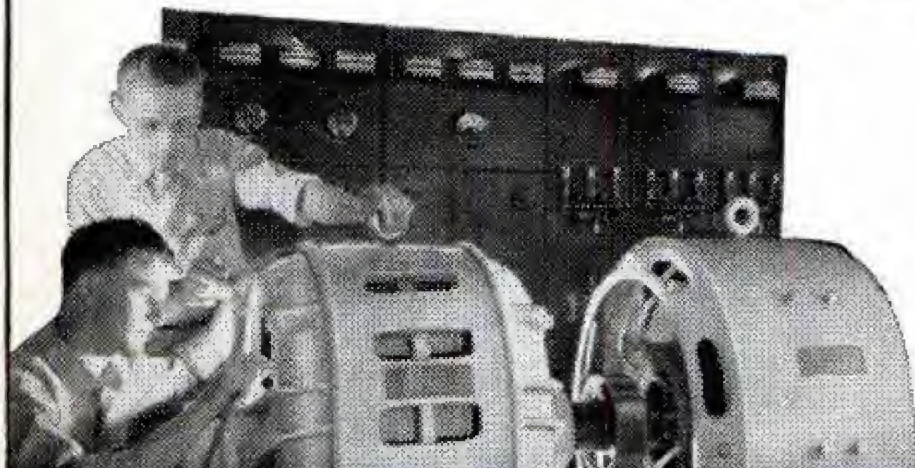


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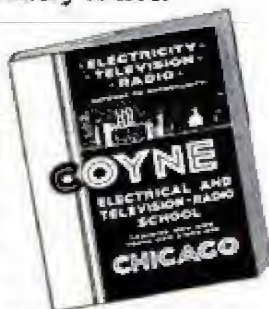
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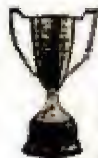
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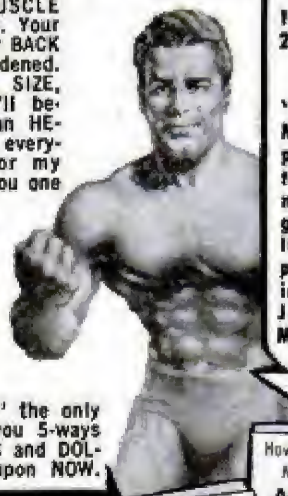
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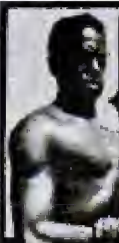
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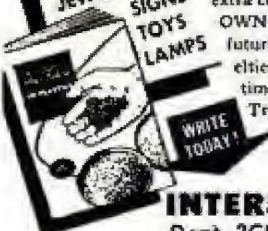
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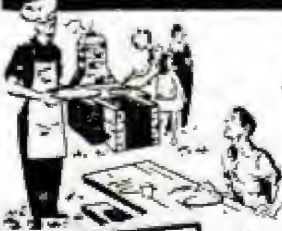


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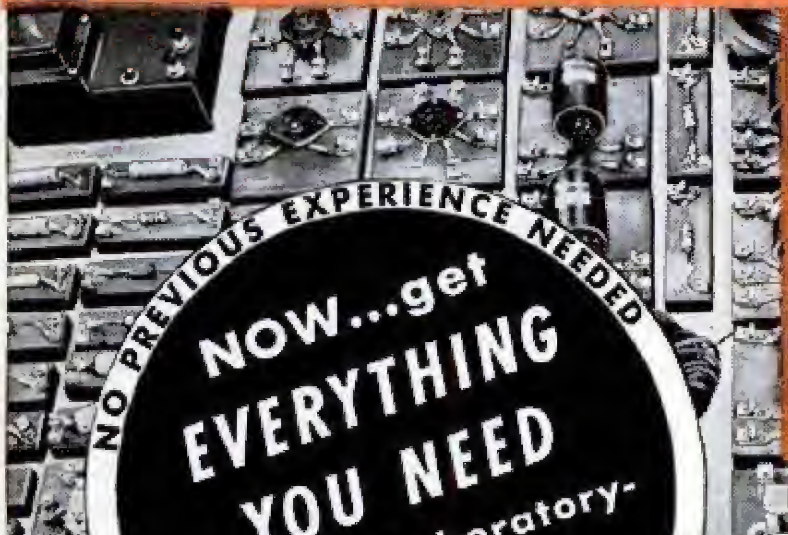
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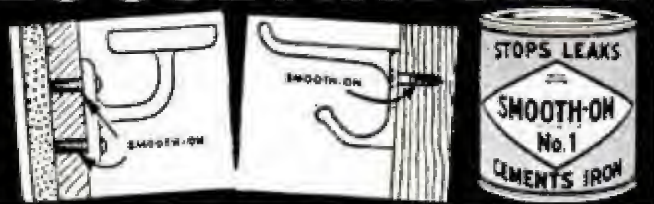
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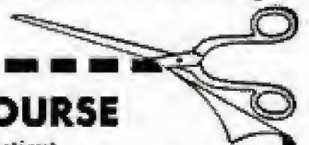
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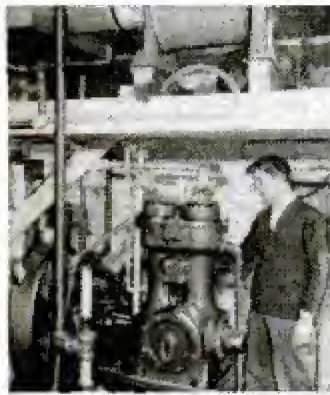
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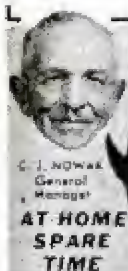
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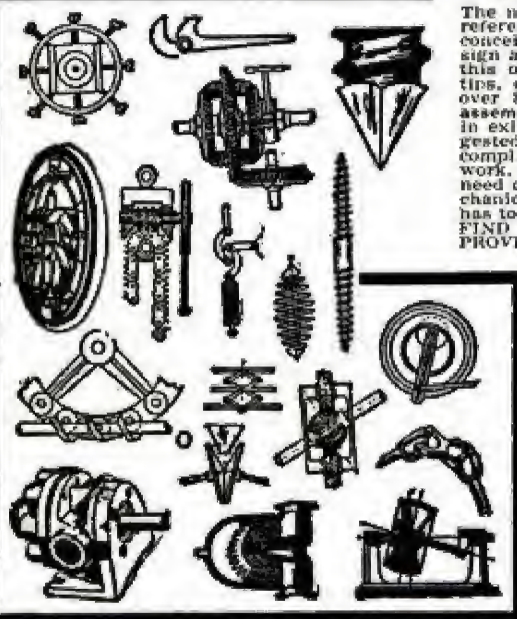
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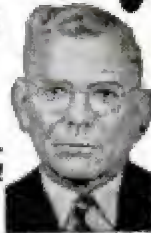
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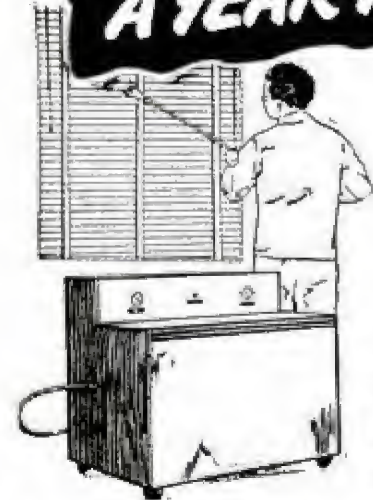
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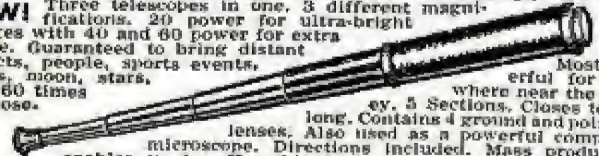
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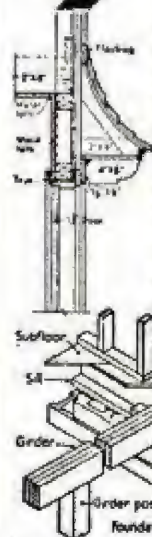
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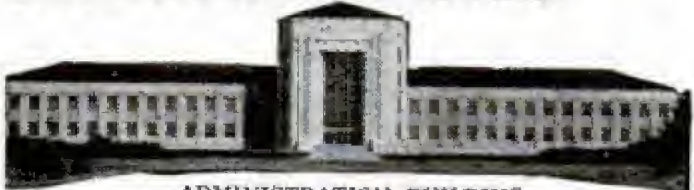
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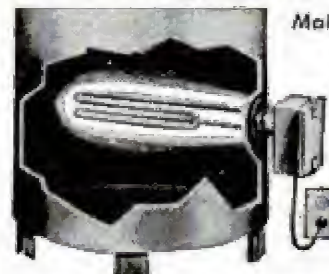
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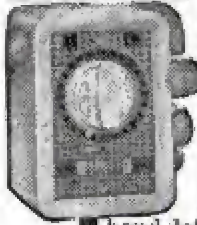
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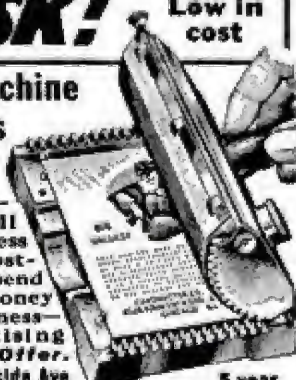
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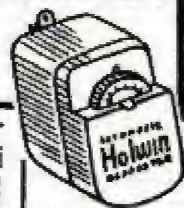
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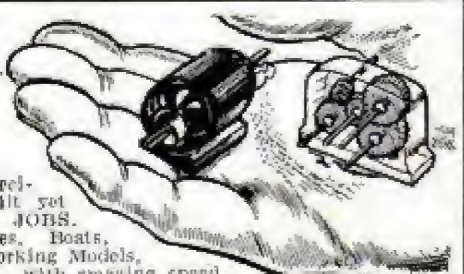
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THREE Professional copies of any photo \$1.00. Portrait paper. Nelson's, 670 No. 8th E., Provo, Utah.

NOW! Get jumbo size prints for 5c, includes developing. Comes in keepsake album. 8 exposure roll, 40c; 12-60c; 16-80. Mailers free. Crown, Box 392, Augusta, Ga.

DOUBLE Size prints 8 exposure roll 30c; 12, 45c; 16, 55c. Same day service. Send for free mailers. Emerson Photo, Box F, Emerson, N. J.

SPECIAL Offer, 8 exposure roll 25c; 12 exposure 40c. Super pak albums, Post-L-Pix, Box 1D, Worcester 4, Mass.

8 OVERSIZE snapshots from roll, 25c with this ad. Foto's, Box 8, Aurora 1, Ill.

JUMBO Album prints—8 exp. 35c; 12, 50c. Free mailer 35mm (36). \$1.00. Flash-Foto, Box 36-M, Brooklyn 4, N. Y.

SATISFACTION guaranteed! Eight jumbo size prints mounted in album, 35c—12 to 16 exposure rolls, 50c. Free mailers, quick service, finest developing, finishing. Crown Studios, Box 1223-PM, Dallas, Texas.

FAST—Same day service! 8 oversized prints in attractive plastic-bound book only 35c; 12-50c; 16-60c. Satisfaction guaranteed. Free exposure guide with first order. Pic-Sure, Box 899-B, Philadelphia 5, Penna.

NEW—16 Oversize contact prints, or 8 jumbos in album 25c. (Trial.) Album Studios, Weatherford, Okla.

8 OR 8 Picture roll 35c, 12 or 16 picture roll 55c. Each roll printed and developed. Handy album pack. If you fail to get pictures on your film a new roll will be sent you without extra cost. Send coin with roll. No c.o.d.'s. Mailing containers sent free. DeLuxe Film Service, Box 1268-A, Shreveport, Louisiana.

BEAUTIFUL Enlargement from each picture on 8 exposure roll 35c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

TWO Beautiful prints from each picture on 8 exposure roll 35c. Thirty-one years of satisfied customers. Quick service. Lens Photos, Dept. J-4, Janesville, Wis.

MAIL Us your films. Prompt service, 8 exposures developed and printed 30c. Foto Art Studio, Box 406, San Francisco, Calif.

16 PRINTS Or 8 jumbos from roll, 25c with this ad. S. Skrudland, Lake Geneva, Wis.

MOTION PICTURES AND SOUND EQUIPMENT

FREE Movies. Thousands of subjects, interesting, entertaining, fascinating. New directory, only 50c. National Cine, 126 Lexington, New York 16, N. Y.

TAPE Recorders at bargain prices! Eighteen makes. 1200 feet plastic tape \$2.10. Write Magnetic Recorders Co., 7120-A Melrose Avenue, Los Angeles 46, Calif.

WE Have it! Send 10c for special listings, and sample film strip. Rayelle, Box 12, Hammels, N. Y.

BARGAINS 16MM. sound films. Also for exchange. Bedner, 5300 So. Talman, Chicago.

CLEARANCE Sale of 16mm. films. Want a real buy in 16mm. sound films? Take advantage of the I.C.S. 1952 clearance sale of 16mm. sound features, comedies, cartoons, novelties, musicals. New, used. Send for our giant list "A" today stating machine you own (make and model). Institutional Cinema Service, Inc., 1560-PM Broadway, New York 19, N. Y.

LEARN Free lance, educational, Hollywood, and television film technique at home. State licensed. Write for free catalog. Motion Picture Institute, Birmingham 4, Michigan.

5000 NEW-Used 8-16mm. silent-sound films. International, 2120 Straus, Brooklyn 12.

8-16MM. Silent-sound films. Complete rental library. All latest subjects. Free catalogue, sample film 10c. Garden Film, 317 West 50th, New York 19.

RENT 16MM. sound films, 50c reel. Large selection; free catalog. Film Service, 128 Chestnut St., Roselle Park, N. J.

GUARANTEED Fresh 8mm. roll, magazine; 16mm. roll, magazine movie films. Color, b&w. Free catalog. ESO-S, 47th Holly, Kansas City 2, Missouri.

MOVIE Camera film; 8mm. roll \$1.50, 16mm. 100' \$3.00. Free processing, Better Films, 742 New Lots, Brooklyn, N. Y.

MUSIC AND MUSICAL INSTRUMENTS

SONGWRITERS—Competition demands modern harmony and singable melodies. Send poems for creative evaluation. Jimmy Seaver, Room 410, 203 N. Wabash, Chicago.

LEARN Piano, Beginners 18 week course \$2.95 (refundable). Immediate results. Stuart Studios, 1227 Morris, Union, N. J.

SONGWRITERS: New, different, honest. Send song lyrics. Dick Reynolds, Leonard 6, Texas.

YOUR Words and our music—A winning combination! Send poems. Free examination. Song Promotion Guild, 350-N Broadway, New York 13.

MUSIC Written to your words. Send poem and \$5.00. E-Z Publishers, 1133 Broadway, New York 10.

ACCORDIONS—Save 50% and up. Cash or terms. New and used, All brands. Wholesale to everyone. Free catalogue. Del Principe, 29 South Cicero, Chicago 44, Ill.

ELECTRIC Outlars, amplifiers, wholesale. Free catalog. Carvin PM, Baldwin Park, Calif.

PLAY Accordion the modern way from records. No instructor necessary. Send for circular P. Pagani, 289 Bleecker, New York 14, N. Y.

YOUR Voice made loud, clear and powerful with my diaphragm exerciser. Inexpensive. Write, Inventor "Oz," 34V, Box 665, St. Louis, Mo.

SWING Piano—By mail, 30 self-teaching lessons \$3. (Samples.) Phil Berton Publications, P.O. Box 1402, Omaha 8, Nebr.

SENSATIONAL Free booklet, "How To Write And Sell Songs." Get the facts first. Poems examined free. Reliable Music Service, Box 430-P, Hollywood 28, Calif.

1952 ACCORDIONS—Wholesale. Free catalog. American Accordion Center, 5329 Belmont, Chicago.

POEMS Wanted for musical setting. Send poems for free examination. Five Star Music Masters, 630 Beacon Bldg., Boston, Mass.

LYRICS Set to music and recorded. Free examination. Cherrier Recording, 732 So. Norton, Los Angeles, California.

MUSIC Arranged. Songs printed. Frank Wildt, Music Publisher, Lancaster, Penna.

POPULAR Songs. How to write and sell them. Write for free booklet Successful Songwriting. Gateway Songs, Box 2470, Hollywood 28, Calif.

SONGWRITERS! Protect your ideas! Hold all songs; poems! Write for Safe Correct Procedure first! Song Service, Dept. P, 333 W. 56th St., New York 19, N. Y.

POEMS Wanted. Broadcast consideration. Sooner Song Co., 22PM North West 8th, Oklahoma City 2.

SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PM, New York 23.

POEMS Wanted to be set to music. Free examination. Send poems. McNeil, Master of Music, 510-PM S. Alexandria, Los Angeles, California.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.

WANTED! Poems for musical settings. Write Songwriters' Service, Clifton, N. J.

RADIO AND TELEVISION

BUILD 15 Radios—Only \$1.30 each. Experience unnecessary. Home radio and TV course includes trouble shooting and servicing lessons, radio principles, code instructions, practical radio building and repairs. You build and keep receivers, transmitters, amplifiers, test equipment and code oscillator. All parts, tools, instructions supplied, including radio tester and electric soldering iron. Send for big, new time and money saving catalog and radio TV repair guides. Enclose 25c. Progressive Electronics Co., 497 Union Ave., Dept. PM-21, Brooklyn 11, N. Y.

ABOVE All, the best TV pictures depend on the efficiency of the lead-in wire. 100 ft. coil Sullivan's 300 ohm activated TV lead-in wire with important instruction sheet \$2.00 postpaid. The Sullivan Electric Co., 1223 First Ave., Seattle 1, Wash.

REPAIR Radios quickly and easily without extensive study and expensive equipment, or your money back. Complete simplified instructions \$1.00. Details free. Slate's Radio Service, Corsicana, Texas.

LEARN Code, theory for amateur, commercial FCC exams. Free information. American Electronics, 1451 Wilkins, Dept. PM-8, New York City 59.

ONE Tube loudspeaker radio diagrams 25c. Net-Loc, 44 Walker, Cambridge 38, Mass.

TELEVISION Towers direct from factory. Write Youngstown Steel Towers Co., Youngstown 8, Ohio.

15 TESTED One-tube circuits 25c, including "Radiobuilder" catalog. Laboratories, 1131-C Valota, Redwood City, Calif.

ENJOY Color TV screen. Send \$1. Mention screen size. Zingo Products, Johnstown, New York.

MAKE Simple, tubeless, batteryless, distance-getting crystal radios. Crystal and illustrated instructions 25c postpaid. Allen, 427-P, Clinton, Mo.

TV And FM antennas. Yagi, conical, bow-tie, mounts, accessories. Lowest prices. Wholesale Supply Co., Lunenburg 1, Mass.

BUSINESS OPPORTUNITIES

RAISE Earthworms—Profitable business. Free folder. Midwest Earthworms, Box 452, Elmhurst, Ill.

I Made a great success in the collection agency business. I can teach you too, quickly. Write me. George H. Cole, Syracuse 2, N. Y.

WALL Tile dealers. Save money! Buy new bevel edge plastic wall tile direct from manufacturers. Artistic Tile, 3010 Irving Pk., Chicago 18, Illinois.

OVER 700% Profit making finished pictures in 2 minutes on the spot in daylight with new PDQ camera, without darkroom. No experience needed. Simple directions teach you quickly. Write PDQ Camera Co., 1161 N. Cleveland Ave., Dept. XPM, Chicago 10, Illinois.

START Your own business on credit. Your own boss. 1566 of our dealers sold \$5,000 to \$27,500 in 1951. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Hawleigh's, Dept. H-U-PPM, Freeport, Ill.

35 AN Hour and more possible in your home. You can paint it with suede. Fabulous new business. Spare or full time. Spray on rainbow colors. Auto dashboards and trunks, signs, radios, toys, figurines, lamps, etc. Beautified with amazing new 3rd dimensional plush-like finish with touch-appeal as well as eye-appeal. I'll send you complete, step-by-step plans and equipment, including high-velocity spray gun for no-risk examination in your own home. Send no money, just name and address. Coast, 1004-AR S. Los Angeles St., Los Angeles 15.

AMAZING Genuine crushed cedar powder! Cedarizes closets, trunks, drawers! Applied like paint; laboratory guaranteed. Hardware, paint, building supply dealers buy quantities. Attractively packaged; tremendous profit potential! Exclusive distributors; investment for merchandise only. Write for samples, details. Millen Mfg., 91-X Summit, Brookline, Mass.

BIG Profits in birdhouses. Accurate scale plans for six different houses 50c. Lokenor, 211 Ship Ave., Beachwood, N. J.

INVESTIGATE Distribution opportunity nationally advertised food supplement. Continual high income. Agency development, retirement plan. 75% repeat business. Details \$1.00, refundable. Ja-Rl Corporation, 1014 Franklin St., S.E., Grand Rapids 7, Mich.

SPECIALIZED Magazines help you to success. Get latest copies through our easy-to-get-acquainted service. Hundreds of business, professional, advertising, agricultural, amusement, architecture, art, astronomy, athletics, automotive, aviation, baking, banking, barber, beauty shop, beverage, fashion, food, home craft, insurance and others covering all interests. Send for list today. It's free. Commercial Engraving Publishing Company, 34C North Ritter, Indianapolis 19, Indiana.

MAIL Order business—Your opportunity. "How To Build Your Own Mail Order Business." Beginner's idea-book tells "how." 25c postpaid. Promptly refunded if not satisfied. Albert Zimmer, 206 Central Ave., Lockland 15, Ohio.

LEARN Silk screen printing; invisible reweaving; repair dolls; make rubber stamps; repair sewing machines. Natural rubber for molds. Free sample. Universal, Box 1076-a, Peoria, Ill.

"MAIL Order Journal." Published monthly. Sample free. R. Mac Callum, 492 44th Street, Oakland 9, Calif.

MAKE \$6.73 Every time you sell one—And they're amazingly easy to sell! We have new adding machines in original factory cartons you can sell for only \$14.95 and you make 45%. They're executive model portables, precision built with automatic clearance, direct subtraction, fully guaranteed. Send for life size color photo with full details. Write today to Lightning Adding Machine Co., Inc., Dept. P20, 1260 West Second Street, Los Angeles 26, Calif.

MAIL Selling opportunities galore! Free! Wehner, Box 142-A, Roxbury 19, Mass.

40% DISCOUNT (Jobber-dealer plan). Power mowers. County agency. Extra profit. Rotacut-51, Excelsior Springs, Mo.

HOW And where to obtain capital? Free details. Star Service, Wapakoneta, Ohio.

MAKE Perfumes at home. Write, "Carey Laboratories," 1914 Chouteau PM-8, St. Louis 3, Missouri.

BUILD Steady income as publisher. Interesting facts, sample periodical 25c. Darnell, Box 566, Jackson, Tennessee.

MAKE 100% Profit selling names. Send \$1.00 for sample name list and instructions. E. C. Ellison, 409 Hazel Street, Warren, Penna.

OPERATE Profitable mailorder business. Write Jasco, 2623-M Columbus, New Orleans 19, Louisiana.

SPARE Time, home operated mail order business. Successful beginner's plan. Lynn, 10420-M National, Los Angeles 34, Calif.

MAKE Perfume. Profitable mailorder business. Catalogue free. "International," 6347 Parnell-PM-8, Chicago 21, Illinois.

NATURAL Molding latex. Extra thick. Free sample. W. Wooley, 115-A Donald, Peoria, Ill.

MAKE Money from newspaper clippings. Siegel, Box 183 PM, New York 2.

START Home mailing business. Little capital required. Instructions telling how, 25c (refundable.) Siwaslian, 4317C Gleane, Elmhurst 73, N. Y.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-832, 7530 Greenwood, Chicago.

POPCORN Poppers, peanut roasters, candy floss. Sno-Konette, Northside Co., Indianola, Iowa.

EARN 400% Selling attractive low priced watches. Free salesman's sample. Result Sales, 580 Fifth Ave., New York 36A.

AUTOMOTIVE Specialties. Sell to bus, truck and boat lines. Contractors, garages, filling stations. Unlimited sales with high percentage repeats. Treanor Corporation, 4013 Truman Road, Kansas City, Mo.

BRONZE Baby shoes. No equipment needed. Start in your home. Big profits, little investment. Samples submitted. Metalizers, 2449 North Broadway, Wichita, Kansas.

WATERLESS Hand cleaners. Highly profitable home mailorder and mfg. business. Simply add water to concentrates or ready-packed under your own label. Everything furnished. Western B Aircraft, Los Angeles 19.

EARN Money painting figurines. Instruction book \$1.00. Louis Crisafulli, 121-A Western Parkway, Irvington, New Jersey.

START A home business in spare time. Make extra money. Experience not essential. Literature free. Chas. Stevenson, St. Marys, W. Va.

FISHWORM Breeding. Manual \$1.00 postpaid. Literature free. Haase, Kent, Ohio.

ELECTROPLATE Novelties, giftwares, baby shoes, autoparts, mirrors. Easy, inexpensive home processes. Portable electroplater, plating salts, formulas, instruction manual, \$5.95. Free booklet. Tyco Metals, Box 13231-MQ, Houston 19, Texas.

SPARE Time business! Sell colorful decalomania home decorations for kitchens, bath, nurseries, gifts, etc. Friends, neighbors buy on sight. Millions sold every year. Start earning real money now. Up to 100% profit. Send postcard for sales plan plus test assortment on approval. Send no money. Decal Art Co., Dept. PM-8, 344 N. Lorel, Chicago 44, Ill.

LEARN Basement waterproofing and concrete masonry painting. Eliminates 1000 hour apprenticeship. Earn specialists spare time maximum. First lesson \$1. Certificate on completion of course. Be a dependable block coater. John Baumgardner, 7350 Cooley Lake Rd., Pontiac 11, Mich.

BOOKKEEPERS Be independent operating our simplified system. Dominion, 74 Sparks, Ottawa 4, Canada.

LEARN Sewing machine repair. Electricity, rent, sell spare time. Make "big money" like our other men-women do. New machines, motors, parts wholesale. Details free. Taylor Service, Hamilton PM-8, Ohio.

IMPORT-Export! Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger 28, Los Angeles 24.

\$500.00 MONTHLY! Operate mail-telephone collection service for businessmen and doctors, spare-time. Free details. Financial, B-740-W, Chicago 90.

START Business without capital! Reliance, 15-A Park Row, New York 38, N. Y.

LIST Your name to receive mail-order offers, samples, money-making propositions. Write Paragon, Box P-2194, Houston, Texas.

MAKE Money! Small home-made pill makes big glass of fizzing pop. Formula and quick selling method \$1.00. Write: Formula, Box 398, Erie, Penna.

EARN Extra money operating mailing-addressing service. Also type manuscripts for authors. Particulars free. L. Torrey, Melrose 78, Mass.

THROWN Away! Tons of ground rubber by recappers. Make it into plastic rubber! 1000 uses! Easy, inexpensive. Start profitable business! Instructions with samples \$1.00. Ceeten Products, 242-X, Crozet, Va.

EXTRA Money. Spin angora wool at home. Angora House, PM, Springfield, Ill.

BIG Profits selling Hollywood stars perfume. Full particulars free. Emly, Box 319 PM-8, North Hollywood, California.

SAWDUST. Turn it into cash. Twenty methods. Instructions 50c. Charles Company, 12-DAG, Norwood, Ohio.

SMALL Investment in Artkote molds puts you in \$5.00 hour stone facing business. Sample mold \$2.00. Dividend Company, Liverpool, N. Y.

FIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write: Typewriter, 8915 Corbet, Tarentum, Penna.

MAKE Money at home. Many ideas to choose from. All proven successful. Big folder free. Write. Palenchar, 1435 John, Whiting, Ind.

LEARN Metalizing baby shoes, jewelry, gifts. Bronze, gold, silver. Complete success plan free. Kiltavi Building, 7217-PM South Broadway, Los Angeles 3.

FREE Formula and instructions for making newest big profit perfume specialties from tap-water. Write today. Decasto of Hollywood, PM3, 1535 North Hudson Avenue, Hollywood 28, California.

300% PROFIT Or more. Send for pattern to make wallet from 1 pc. of leather. No sewing. Scissors and pattern needed only. \$1.00 check or money-order. S.E.B., Box 33, Westville, N. J.

MUSHROOMS Grown. Boxes, barrels. Manureless process 50c. Spawn \$1.00. Gordons, 553 William, Winnipeg, Manitoba.

MAKE Money at home mailing catalogs—Fast-selling publications, merchandise. Everything furnished. Orders filled. Big earnings. Sample, information 25c. Sterling, Great Neck 12, N. Y.

SELL By mail to automobile owners. Millions of prospects. Fast selling items. Everything furnished. Write: Eastern, Box 142-P, Dorchester 24, Mass.

MAKE Money at home mailing cards, circulars. Everything furnished. Start at once with almost no investment. Paton, Box 55-P, New York 23, N. Y.

BIG Profits making new greaseless doughnuts. Start in kitchen. Wholesale to grocers and cafes. Free plans. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minnesota.

REPRESENT Us in your area. Write for descriptive folder. International Trading Center, 1900 Euclid, Cleveland 15, Ohio.

PRINT Without a printing press. Big profits! See page 34.

RESILVERING Mirrors, formula 50c; two-way lookout mirrors, (No one sees you), 50c; coppered mirrors, 50c. All \$1.00. Nelko-Mir, Box 3462, Chicago 54.

AMAZING, Refinish auto dash. Grain appears like magic. Details free. Modern Aids, 248 So. Main, Jamestown, N. Y.

BIG Money and fun growing live miniature Ming trees on your window sill. Write for free rare tree seed and plan. National Nursery Gardens, 8463 South Van Ness, Inglewood 4, California.

SEA-Shell for making gifts, novelties, jewelry, Catalog 10c. Instruction book of 155 photographed designs \$1.10. Giftcrafts, Box 4550-PX, Coral Gables, Florida.

MAKE Your home workshop pay up to \$6.00 hourly for your spare time. Even more with wife's help, and she'll love it! Details free. The Old House, Box 8, Spring, Texas.

FLEXIBLE Rubber moulds for plaster and Marbleite figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 23, Easthampton, Mass.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

\$200 WEEKLY Reported! No selling. Free booklet. T. J. Surface, Roanoke 4, Virginia.

GROW Mushrooms. Boxes, basements, gardens, lawns, grasslands. Instructions 35c. Mushroom spawn \$2.14. New manure-less process \$2.50. Send for complete 3 item new kit \$4.99. No c.o.d. please. Guaranteed fresh spawn or your money refunded. Thomas Co., Dept. 80, 3604 30th Ave. S.W., Seattle, Wash.

EARN Money at home with your typewriter! Spare time! Details free. Edwards, Publisher, 3915-PM 12th, Des Moines 13, Iowa.

CASH Income from your backyard! Details free. Pickett's, Florence, Kentucky.

FREE Illustrated course casting novelties genuine latex for moulds. Major Chemical and Latex Co., 25 Allerton Street, Boston 19, Mass.

ESCAPE Wage slavery. Easily. Operate your own profitable lifetime business. Free literature. Corley, H285 Carlton, East Rutherford, New Jersey.

WHY Not make extra dollars repairing zippers? Excellent profits uncrowded field. Details free. Texas Specialty Company, 204-B Texas, Texarkana, Texas.

FREE Folder—100 ways to make money in silk screen printing. National, Box 48-PM, Dorchester 22, Mass.

SELL By mail to women—Real merchandise. Everything furnished, orders filled. Big profits. Charles, Box 32-S, New York 63, N. Y.

YOUR Own mail order business offers unlimited earning possibilities. Exciting details free. Smith Sales, Box 121F, Terre Haute, Ind.

HAVE Home mail business! Success assured by helpful idea-mailbox service. Booklet 25c. Details free. NMD Agency, Box 88-M, Dorchester 22, Mass.

START Mailorder bookshop—Build your future. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, New York.

NEW Ideas and items. 25c brings samples to retail for \$1.00. Specialties, Box 475E, Park Ridge, Illinois.

BECOME Contractor associated with national organization. Man experienced in roof repairs, waterproofing, coatings. Operate own business under your trade name. Franchise protection. "Luster-Kote," 19417 Derby, Detroit 3, Michigan.

START A Venetian blind laundry. Profit opportunity for lifetime business. New machine method. Free booklet on request. F. C. Co., 442 N. Seneca, Wichita 12, Kans.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience. No capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

MAKE Tough, durable plastic—1c pound. Makes attractive floors, walls, built-ins, roofs. Build good home, \$150.00 room. Bays Laboratory, Oklahoma City 9.

LIQUID Molding rubber, \$2.95 quart, \$9.95 gallon prepaid! Plastercraft Supply Company, 3051 St. Clair Ave., Cleveland 14, Ohio.

LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-P Carlyon Road, East Cleveland 12, Ohio.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-R Chestnut, Hamilton, Ohio.

21 POPCORN, Candy apple formulas, proven money-makers. Send \$1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 35c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

BOOKKEEPERS—Earn \$5000 yearly part time. Sell, operate new sensational CPA bookkeeping service. Kern, 4942 Vineland, North Hollywood, Calif.

GOOD Paying business silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

POPCORN and potato chip equipment. Long Eakins Company, 5260 High, Springfield 99, Ohio.

BUY Wholesale. Thousands articles. Supply directory, 10c. Idealso, Park Ridge, Illinois.

EARN Extra money! "Homeworker Magazine" tells how. Sample 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30.

BOOKKEEPERS, Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

FREE Book "505 Odd, Successful Businesses." Work home! Expect something odd! Pacific, Oceanside, Calif.

\$46 FROM Square foot plywood; jigsaw necessary. Write: Woodarts, Bridgewater, Mass.

EXTRA Money—No selling, operate vendors. Amazing profits, details free. Silver King, Suite 220, 622 Diversey, Chicago 14.

BUY It wholesale! Manufacturers, distributors offer 850,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

EARTHWORM Breeding? First, get unusual story. "An Earthworm Turned His Life." Free. Earthmaster, Dept. 14, El Monte, Calif.

INCOME From local information. No selling. Write Neherco, La Verne, Calif.

UNPAINTED Bookends, plaques, statuettes, figurines. List. Haverly Products, 822-17th St., Altoona, Penna.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Ro, Oakland 6, Calif.

MADE \$24,500 Using money making plans from Schemer Magazine, world's oldest mailorder publication. Box 275M, Canfield, Ohio. Year \$2.00. Sample 20c.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, EEl, Wisconsin.

COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser, details, dime. Vanroy Shirk, Lebanon, Penna.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

MONEYMAKING OPPORTUNITIES

595 MONEY Making secrets. Send stamp. Book Service, P.O. Box 453, Port Chester, N. Y.

TE-Breaker picture puzzles exposed, \$2.00. Wenograd, Box 1495, Philadelphia 5, Penna.

REAL Live Mexican jumping beans. Big profits. Mann's, 5330 No. Natoma, Chicago 31.

CHURCHES, Clubs, organizations, receive \$130.00 plus 12 card tables free. Unique Gift Plan, Pine Hill, New Jersey.

BE Independent, be secure, have your own profitable business—Earn \$20.00 and more a day making beautiful, fast-selling lamps at home. No equipment needed. Illustrated course teaches you quickly. Course, parts catalog, wholesale price list—only \$2. Gearon Co., Dept. 200-B8, 27 S. Desplaines, Chicago 6, Ill.

SCHUHMACHER Matmakers. Convert old tires into dollars. Devote full or spare time. S and S Patents, Inc., 1307 North Clark St., Chicago 10, Ill.

LUCRATIVE Self employment. Over 100 ways. 25c. Elhil, Assonet 1, Mass.

GROW Miniature dwarfed trees. Instructions 50c. Metro, Box 103-PG, Berwyn, Illinois.

FREE! Several money making offers, copy Home Mailorder Plan. Jenkins, Lucasville, Ohio.

FREE! Radio advertising. Pay stations commissions on orders or leads received. No investment. Hundreds of stations do this. Mishek, Waseca 2, Minn.

GET Money making offers. All parts United States. Trial listing 10c. 3 months 25c. year \$1. Powell, 5713-A Euclid, Cleveland 3, Ohio.

HOW To get your mail order advertising free revealed by famous expert. Also other "inside" secrets. Free details. Benson Barrett, 1751-A Morse, Chicago 26.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

MAKE Money—Sewing and assembling at home. Lebig Industries, Beaver Dam 10, Wisconsin.

GROW Mushrooms. Boxes, basements, gardens, lawns, grasslands. Instructions 35c. Mushroom spawn \$2.14. New manure-less process \$2.50. Send for complete 3 item new kit \$4.99. No c.o.d. please. Guaranteed fresh spawn or your money refunded. Thomas Co., Dept. 81, 3604 30th Ave. S.W., Seattle, Wash.

BOOKKEEPERS Earn \$100.00 week operating bookkeeping-tax service. Details free. Universal, Box 664-M, Springfield, Missouri.

BRAND New sure fire money maker. Write Post-Rite, Box 602, Sioux Falls, S. Dak.

SELL Titania gems \$9.75 carat, wholesale. More brilliant than diamonds. Free catalogue. Diamonite, 1404M Mitchell, Oakland 1, Calif.

\$10,800 PROFITS! Your own mailorder business! No capital risk! "Success plan" (worth \$2) free! Write today! Treasury, 149 Storer, New Rochelle PM-1, New York.

MAKE Perfume—Everything supplied, no equipment needed. Sample fragrance, details free. Genmerco, Box 142-PM, Dorchester 24, Mass.

\$100-\$200 WEEKENDS No selling or manufacturing. Brennan, 4025-Z Lanker-shim, North Hollywood, California.

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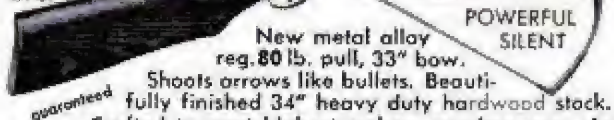
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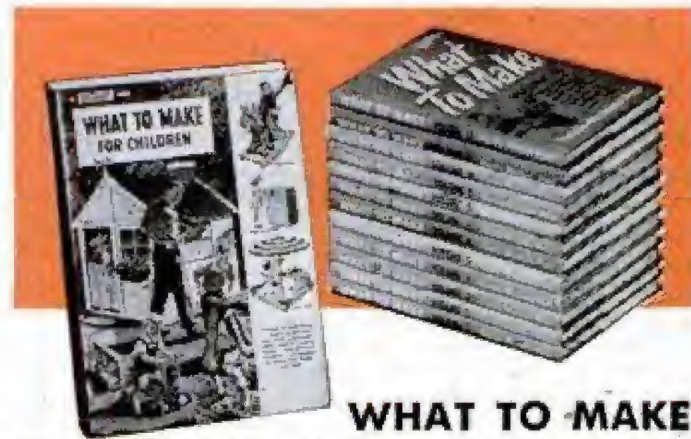
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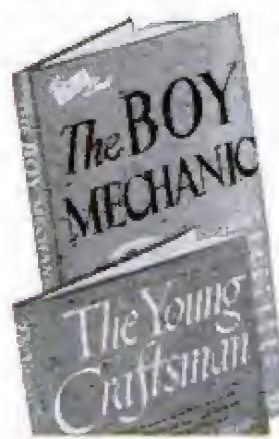
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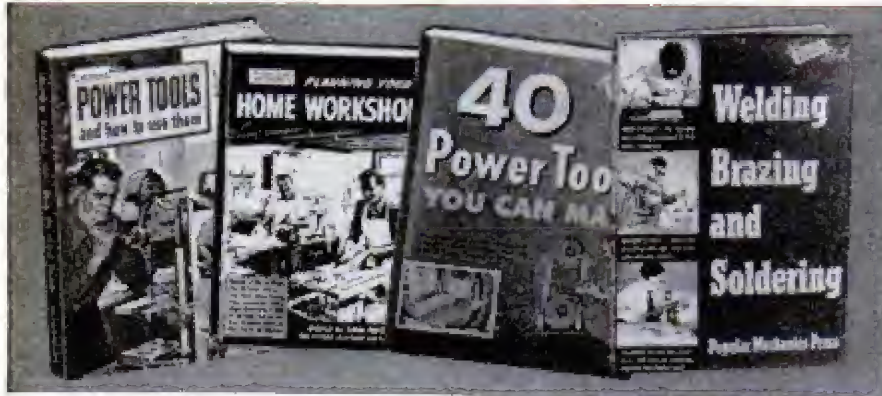
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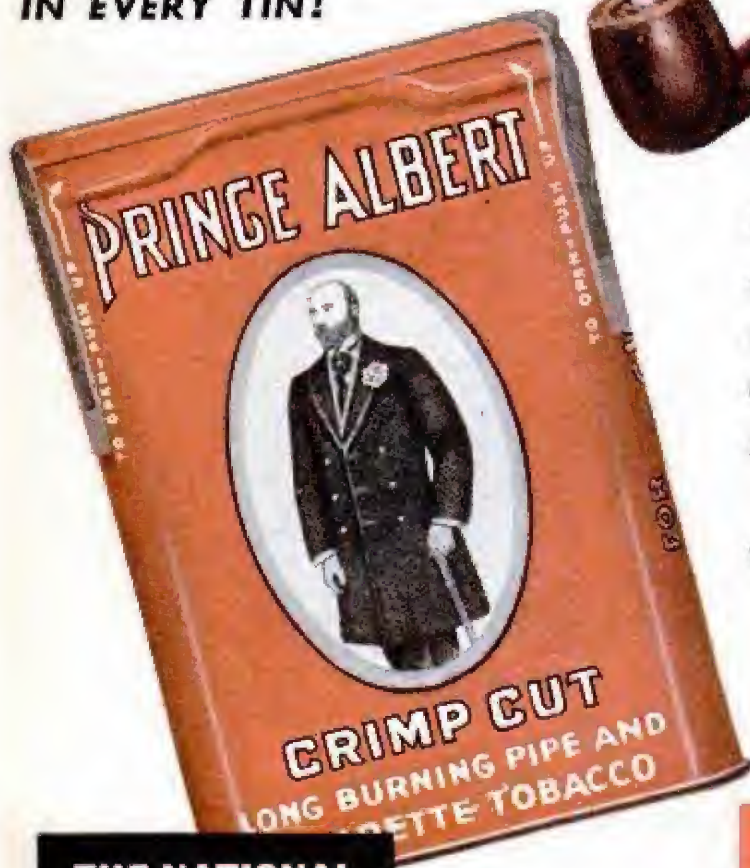
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Shall We Move to Another Planet?

By Thomas E. Stimson, Jr.

THE TIME IS coming when mankind will have to reconstruct the solar system.

That's the startling assertion of Fritz Zwicky, professor of astrophysics at the California Institute of Technology.

Professor Zwicky says that we may have to rearrange the planets and in some cases rebuild them to fulfill our future requirements for living space.

Not even Mars could be colonized on a large scale at present because it lacks a suitable atmosphere. It may pay to send Mars off on a tangent past some other planet to draw off an atmosphere and then return the red planet to its present orbit.

To make one of the large outer planets habitable would be an even more tremendous task. The planet would have to be

Glenn L. Martin Co. photo



← Prof. Fritz Zwicky operates 18-inch telescope at Palomar Observatory. Right, a nose view of a towering "Viking" rocket that climbs 135 miles





↑ Big telescope-camera takes close-up research photos of rockets at altitudes above 100 miles

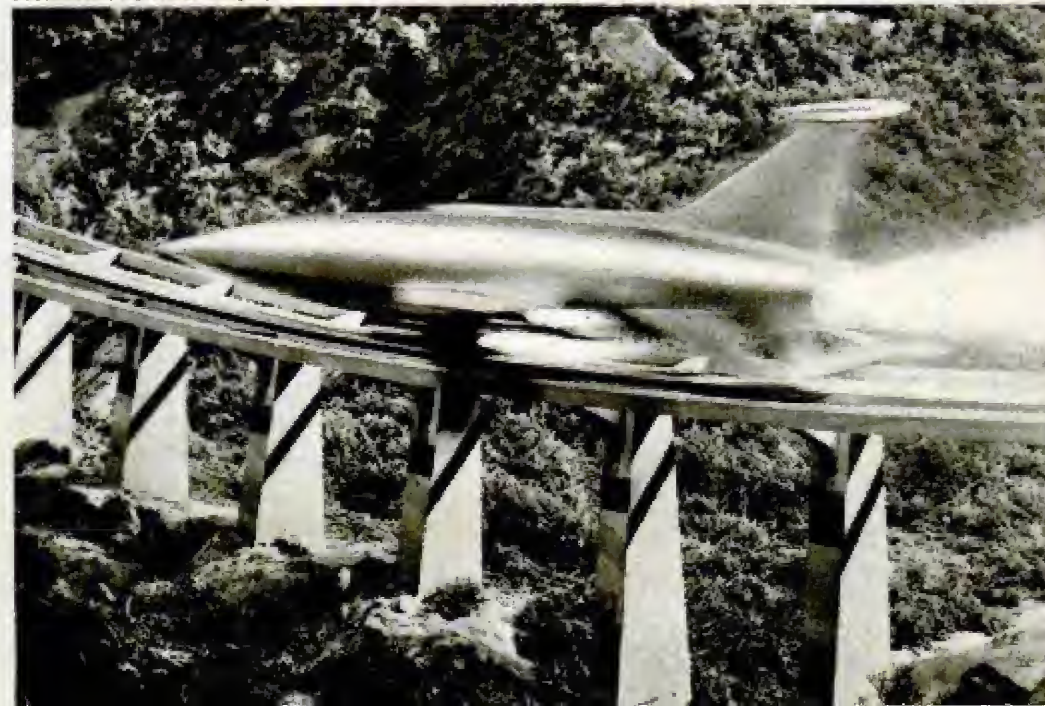
← High-acceleration rocket at White Sands starts its long climb, blazing gases from its tail leaving a fiery sky trail

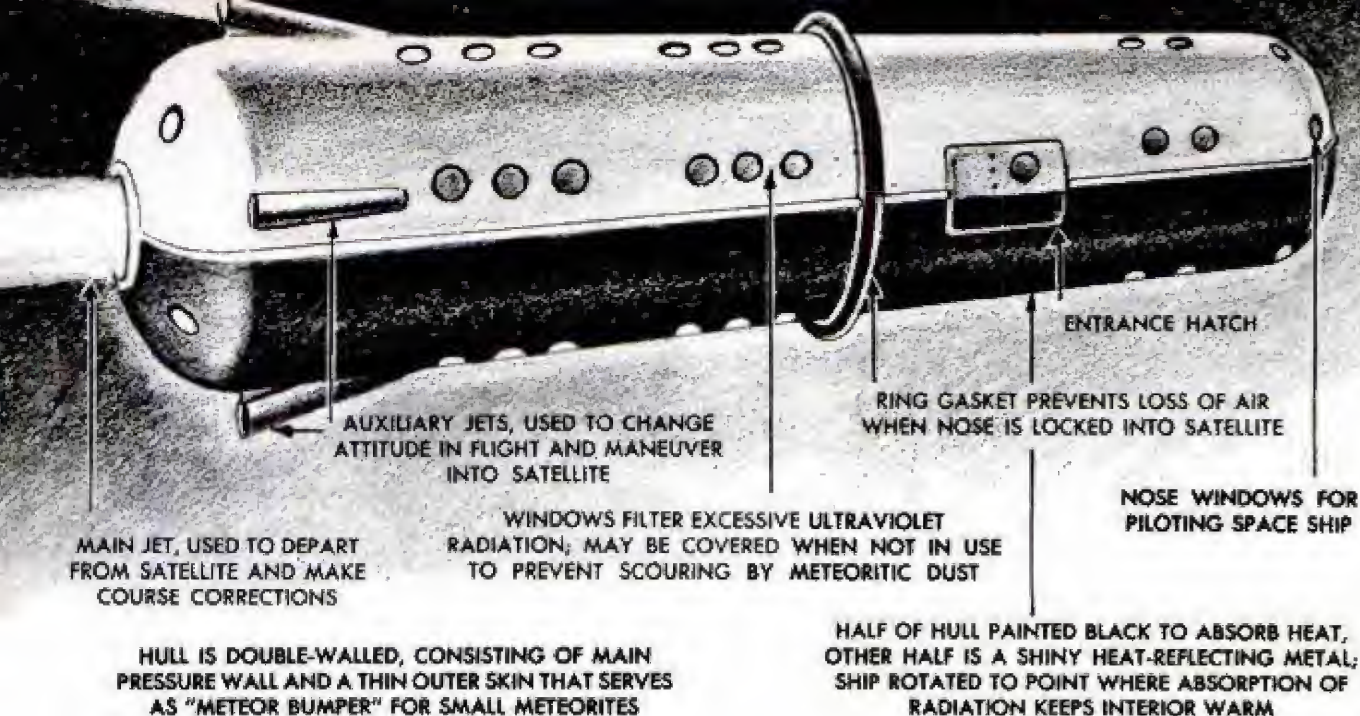
Right, Navy research men crouch behind wall as an artificial meteorite is fired in penetration test

Below, in a movie version of take-off, rocket uses thrust of its main motor plus rockets on launcher



Paramount Pictures Corp. photo





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WINDOWS FILTER EXCESSIVE ULTRAVIOLET RADIATION; MAY BE COVERED WHEN NOT IN USE TO PREVENT SCOURING BY METEORITIC DUST

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RING GASKET PREVENTS LOSS OF AIR WHEN NOSE IS LOCKED INTO SATELLITE

NOSE WINDOWS FOR PILOTING SPACE SHIP

HULL IS DOUBLE-WALLED, CONSISTING OF MAIN PRESSURE WALL AND A THIN OUTER SKIN THAT SERVES AS "METEOR BUMPER" FOR SMALL METEORITES

HALF OF HULL PAINTED BLACK TO ABSORB HEAT, OTHER HALF IS A SHINY HEAT-REFLECTING METAL; SHIP ROTATED TO POINT WHERE ABSORPTION OF RADIATION KEEPS INTERIOR WARM

Artist's concept of space ship is a huge cylinder. Streamlining would be of no value in frictionless space

broken apart or shrunk to about the size of earth to provide a comfortable surface gravity. It would have to be endowed with a useful atmosphere. Finally, it would have to be moved closer to the sun, at about earth's orbit, where it could absorb enough solar radiation for our needs.

These are fantastic ideas, but are they absurd? Not necessarily, Professor Zwicky believes. He points out that unlimited power will be available when nuclear fusion is achieved and that no fundamental principle seems to stand in the way of using nuclear fusion on a large scale. (Fusion is the combining of light elements into heavier ones, as is done in the sun, in contrast to the present nuclear-fission processes in which heavy atoms are split into lighter ones.)

With nuclear fusion, he continues, it should be possible to create and control a jet that would approach the proportions of those produced in minor stellar eruptions. This would be the tool with which the planetary system would be juggled about. A tremendous lopsided jet on the surface of a planet could divert the body from its accustomed motion. Jets might also be used to decrease the mass of the planet or to increase the masses of its satellites.

Professor Zwicky's conclusions arise from what he terms "morphological thinking," the orderly listing of all possible solutions to a given problem. Most devices and processes in the past were invented helter-skelter, he asserts, and yet nothing can be thought of that is not already waiting for us in the morphological box. Instead of attacking a problem haphazardly, it is wiser to state the problem formally and then to consider all possible solutions not prohibited by the laws of nature.

One might confidently start work tomorrow on the theoretical and mathematical problems of rebuilding the planetary system, the Caltech astrophysicist says, since enough knowledge is available to guarantee that very little of the work will be found later to have been done in vain.

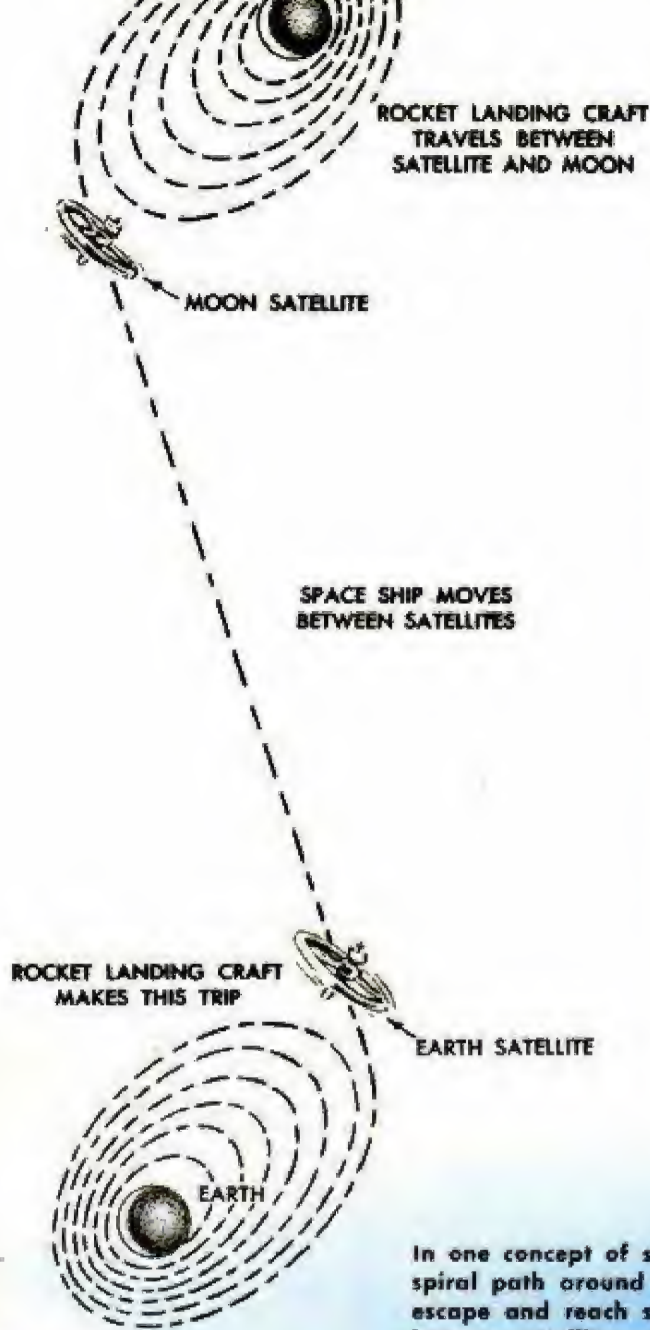
"However, there is one danger," he declares. "Through poor handling of the operations, or maliciously, the earth itself might be exploded. We must be concerned with the stabilization of large bodies against nuclear fusion as well as with the processes of ignition."

Several centuries may elapse before mankind is ready to test Professor Zwicky's proposals; long before then, many scientists are convinced, we'll be able to fly regularly to the moon and will have explored Mars and Venus. One of these feats may be accomplished during the next 50 years. Today hundreds of research workers in this country alone are engaged directly or indirectly in solving the highly involved problems of astronautics.

Research on long-range military rockets has yielded much information about propellants and power plants suitable for space flight. The principles of astrogation, or space navigation, have been worked out by astronomers. Study is being given to "canned air" and the other problems of living in empty space. The scouring of meteoritic dust on windows and the graver hazards of heavy primary cosmic-ray radiation and collisions with meteors are subjects of research.

Even the legal aspects of laying claim to celestial bodies have been discussed.

One of the phenomena to which space travelers will be subjected is weightlessness,



In one concept of space travel, a rocket would take spiral path around earth, accelerating until it could escape and reach satellite. Space ship would travel between satellites, another rocket would land on moon

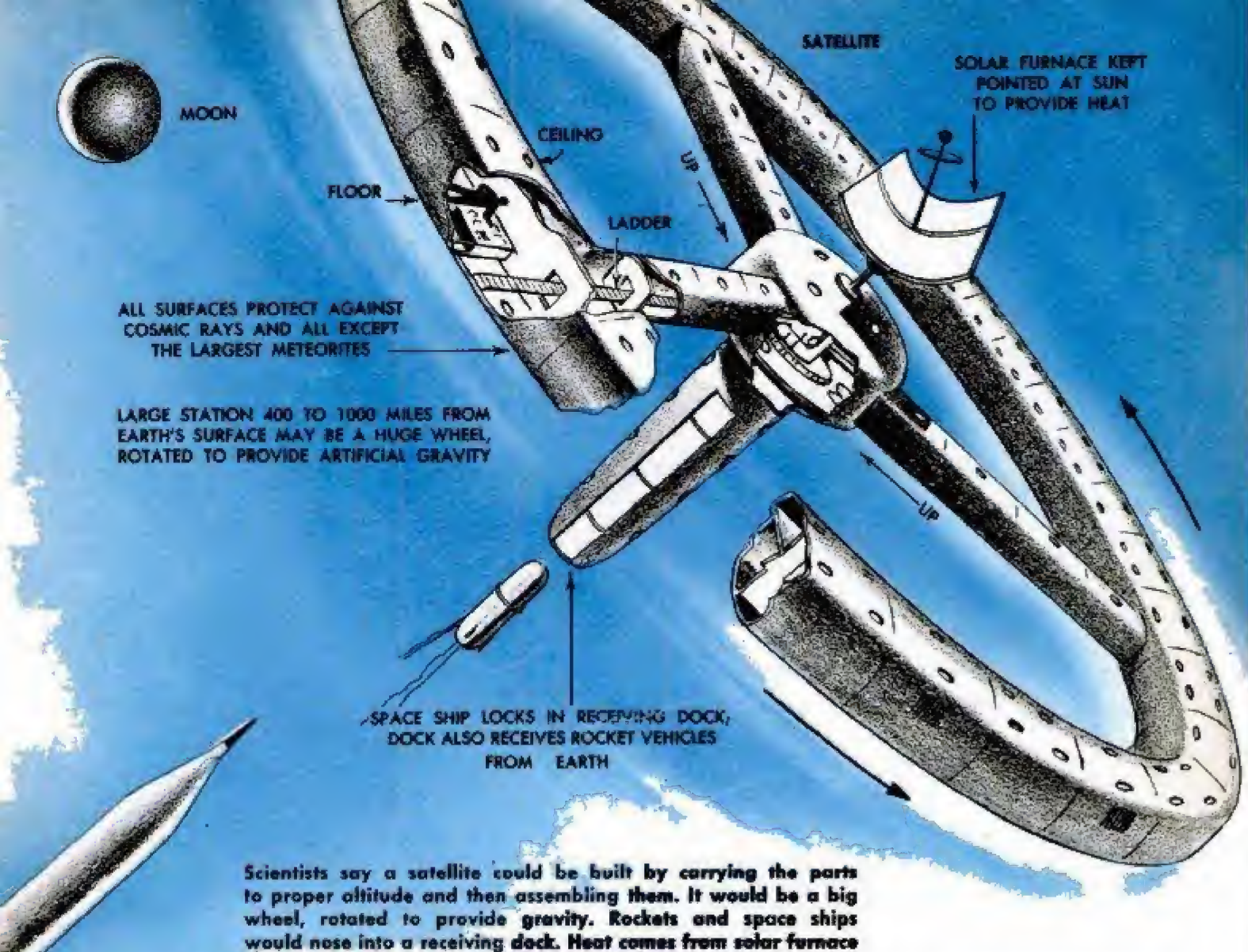
a condition now engaging the special attention of the space-medicine division of the Air Force School of Aviation Medicine at Randolph Field, Tex.

"Zero gravity will give one the sensation of falling into a bottomless pit, no matter how tightly he holds on to his seat," a member of the space-medicine team remarks. "A sudden transfer to the gravity-free state will not be recommended for weak souls, though one may count on a gradual adaptation to the strange sensation of being in a perpetual fall."

Weightlessness is a far more serious condition than might be supposed. The space-medicine scientists are concerned, among other things, about the possibility that a person in a gravity-free state would suffocate in his own breath. There would be no circulation of air in a room that has zero gravity; hence after a person had expelled a few lungfuls of air, he would be rebreathing his own exhaust gases. Some kind of forced circulation would have to be provided, not only for humans but for such devices as heat exchangers.

It would be possible today to build an unmanned step rocket that would escape from earth, never to return, or to shoot a few people in an ionocruiser to an altitude of 200 miles, from which height the winged rocket could glide slowly back to earth. Even an unmanned rocket that could crash-land on the moon is a marginal possibility with today's knowledge. But round-trip flights through space must wait until more





ALL SURFACES PROTECT AGAINST COSMIC RAYS AND ALL EXCEPT THE LARGEST METEORITES

LARGE STATION 400 TO 1000 MILES FROM EARTH'S SURFACE MAY BE A HUGE WHEEL, ROTATED TO PROVIDE ARTIFICIAL GRAVITY

SPACE SHIP LOCKS IN RECEIVING DOCK, DOCK ALSO RECEIVES ROCKET VEHICLES FROM EARTH

Scientists say a satellite could be built by carrying the parts to proper altitude and then assembling them. It would be a big wheel, rotated to provide gravity. Rockets and space ships would nose into a receiving dock. Heat comes from solar furnace

efficient propellants have been developed.

To escape from earth a rocket must move at the rate of 25,000 miles per hour, about five times the speed attained by the nose section of one of the bumper rockets fired at White Sands Proving Ground. The speed of escape from the moon is a mere 5300 miles per hour because of the smaller size of that body.

The theory of space travel is based on the idea that after a rocket gets away from earth it would continue to travel at its escape speed without the use of power. It would become a celestial body whose path and ultimate speed would be governed by the pull of the sun and planets. To reach a particular target, such as the moon, it would be necessary to fire the rocket at a predetermined time in a certain direction.

Professor Zwicky suggests that chemical energy for attaining escape speed may be found in the excited atomic particles that exist high in the earth's exosphere. If these could be utilized in a ductlike motor it might be possible to drive a rocket at greater and greater speeds as it circles the earth, finally escaping into space without discomfort from high accelerations. Until we learn differently, he concludes, there

is even the possibility that space itself contains some form of energy or matter that could be used for propulsion. This would greatly simplify solving the problems of navigation.

Present research on power, however, is along orthodox lines. An atomic power plant might be one solution, although by itself this energy would not be sufficient. Anthony J. Nerad of the General Electric Research Laboratory suggests that an efficient propellant may be found in the metallic hydrides. These compounds contain large amounts of hydrogen in chemical combination with a metal. Volatilized and expanded in some kind of motor, the hydrogen may prove much more efficient than any rocket propellant we now have.

Rocket scientists generally agree that we won't take off from earth and fly directly to such a destination as the moon. A trip like that would be made in three stages utilizing two transfer points.

Stage one would be the lift from earth to a satellite station possibly 1000 miles out. A rocket of moderate acceleration and probably conventional appearance might be used. Stage two would be the long trip

(Continued to page 224)



Pack-Horse Litter

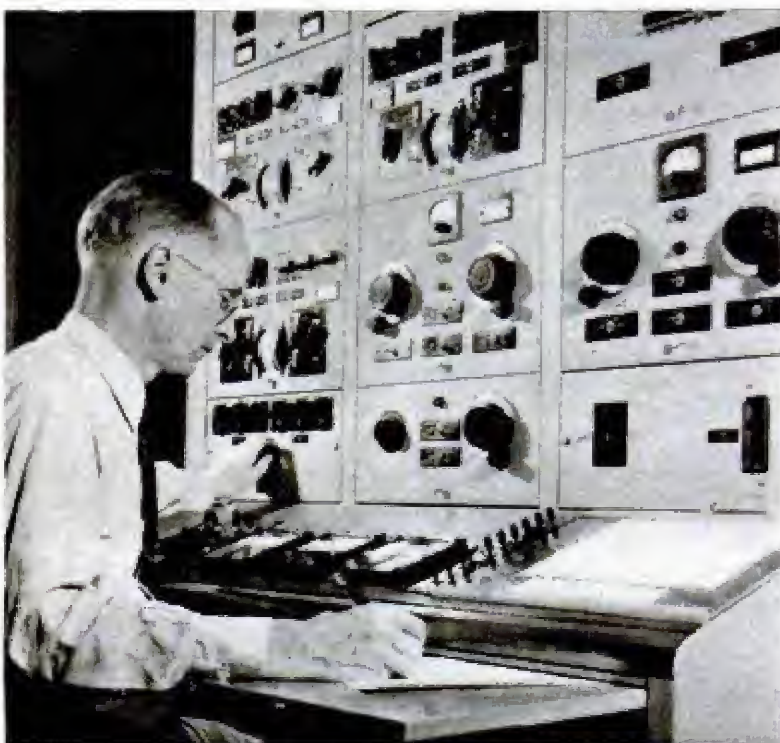
Injured mountain climbers are brought down to a hospital safely on a basket litter that is fastened securely to the back of a pack horse. The injured person lies flat on

the litter and is carried down steep trails quickly. Designed by Elmer Jensen, operator of the Frontier Pack Station at June Lake, Calif., the litter already has been used to bring a Boy Scout out of the mountains when stricken with appendicitis.

Rinse Stops Static Generation in Synthetic-Fiber Garments

Simply by adding a teaspoonful of a new chemical to each quart of rinse water when you do the laundry, you can eliminate the tendency of synthetic fibers to develop static electricity. Thus rinsed, garments of

nylon and other synthetic fibers won't crackle, cling uncomfortably to the body or create sparks when removed. One rinsing lasts indefinitely, or until the next washing.



Calculator "Tests" Nonexistent Motor

Electric motors that have not yet been built are "tested" by a calculating machine developed at Westinghouse. Previously, expected performance had to be computed by engineers with pencil and slide rule, a job that took several days. The calculator does the same operation in more detail in a few hours. Engineers create an electrical "model" of the motor and by varying the elements of the model they can determine effects of temperature, overloading or a short circuit on the new design.

Discovery of an oil field near Umiat, Alaska, containing an estimated 30 to 151 million barrels, has been confirmed by the Navy.



Most Authentic Map

Recently completed, a map of the Western Hemisphere incorporates the findings of explorers, navigators, surveyors and aerial photographers, making it the most up-to-date map in existence. The map, measuring 51 by 34 inches and printed in eight colors, was prepared by the American Geographical Society. One inch on the map represents about 200 miles on the earth's surface. A unique feature is the map's pro-

jection, invented especially for the Western Hemisphere. Since making a map means plotting part of a spherical surface on a flat piece of paper, no map can be entirely free from distortion. The new projection uses two focal points, one in the North Atlantic and another in the South Pacific. The result is a map in which all land areas are nearly true to scale. Measuring the distance between two points requires only a ruler as a straight line always represents the "great circle."

Railroad Puts Wind to Work

Automatic signals at a junction point of the Chicago and Eastern Illinois Railroad south of Chicago are operated by electricity made by the wind. Two small windmills, one at each approach to the junction, charge batteries that power the signals. Use of windmills saved the railroad 104,000 feet of wire and eliminates considerable maintenance required by overhead wires.





Lightning

Trappers

Lightning made by man, three million volts of it, crackles across these 22 insulators in a laboratory test

By Jack Andrews

IT'S OPEN SEASON on lightning at Westinghouse and General Electric. From June to September, engineers from the research laboratories of these two companies go out trapping thunderbolts.

Their traps are set in several hundred choice locations spread over a dozen states — atop skyscrapers, smokestacks, forest-

Lab lightning strikes model power line. Struck wire carries no power, is grounded to protect other lines

fire lookout towers and other potential targets of the powerful arc. Special recording devices take down vital statistics about the flashes and from this data science is developing a better understanding of nature's spectacular electrical discharges.

The engineers are interested in lightning because it can disrupt modern living completely. When the use of electricity in homes and factories was rare, a break in electrical service caused no great hardship. But today most of the comforts of our homes are run by electricity and hospitals and factories are entirely dependent upon it. Whole towns become almost helpless when power goes off for a few minutes.

Lightning is trapped by a number of special instruments — fulchronographs to record the amount of current and the shape of the bolt; cathode-ray oscillographs to record the intensity of the current; magnetic

links to "fingerprint" the stroke, and special cameras to take pictures of it.

Lightning engineers, however, rely most heavily upon the fulchronograph. The word is a combination of Greek and Latin—*fulmen* meaning lightning, *chrono* meaning time and *graph* meaning a picture. Encased in a box 18 inches square, this device consists principally of an electric motor and a slotted aluminum wheel. The number of blades magnetized and the amount of magnetization in each tell the engineers a lot about each lightning bolt they "capture."

One of the most elaborate outdoor thunderbolt traps is located 535 feet above the ground on the roof of the University of Pittsburgh's Cathedral of Learning. Here lightning racing down the 50-foot steel mast is channeled through various protective devices to test their efficiency. Six special instruments take its "fingerprints," snap its

Four million volts of electricity are made to leap across the gap between these two spheres in lightning lab





Ben Franklin invented the lightning rod about 200 years ago. Science now proves him right. Above, with no protection, tower on model splits open. Below, with it, the 2.4 million volts go harmlessly to ground



"picture" and examine its "calling card"—all of which information the engineers take to their laboratories and study.

It was atop the University of Pittsburgh's tower in 1947 that engineers trapped a lightning superbolt, thought to be the largest ever recorded. It consisted of five separate surges, at least one of which contained an estimated 345,000 amperes of electricity. This is equal to the current flowing into 200,000 average homes.

Other direct-stroke stations are maintained in such locations as the top of the Empire State Building in New York City and the 585-foot smelter stack of the Anaconda Copper Mining Company in Anaconda, Mont.

From studies of both natural and man-made lightning, we now have a pretty good idea of what causes thunder and lightning and how they behave.

The energy of strong upward currents in thunderclouds separates the electrical charges found there. The positive charges are carried into the top regions of the cloud; the negative charges accumulate in the lower regions. In addition, the earth's surface contains positive charges. The electrical force produced by these two sets of charges tries to pull them back together again. This starts a giant spark which is called a lightning discharge.

Most lightning flashes leap from one cloud to another across a pathway five to ten miles long. The flashes that do most of the damage, however, are those that arc between the clouds and the earth. These are five miles or less in length and, contrary to common opinion, spurt from the ground upward to the sky. An invisible stroke moves slowly from the clouds down to earth to start the phenomenon. When it touches the ground, a brilliant flash, which we call lightning, spurts upward from earth to the heavens.

Each square mile in the United States receives 10 lightning strokes a year, on the average. Areas most frequently hit are the Rocky Mountain states and the deep South. Least frequently struck are states of the West coast, New England and the middle Atlantic seaboard.

Westinghouse engineers have discovered two kinds of lightning—"cold" and "hot." The cold variety shatters trees and makes a loud report. This explosive kind of lightning is called cold because it expends its high electric current in one brief burst that is insufficient to ignite anything. Hot lightning is quieter but it burns trees and barns because it stretches a relatively low current over a longer period of time.

To the eye, thunderbolts look like one single, blinding flash. In most cases, however, there are at least two electrical dis-

charges over the same path and sometimes as many as 40. They appear to be one because they repeat their triphammer blows in the wink of an eyelid.

This information gathered in lightning traps has been used to build improved protective devices ranging all the way from giant lightning arrestors two stories high and circuit breakers weighing 12 tons to tiny insulators no larger than a pack of cigarettes.

General Electric recently completed a \$2,000,000 high-voltage engineering laboratory at Pittsfield, Mass. Westinghouse engineers create lightning in three laboratories — Sharon and Trafford, Pa., and Sunnyvale, Calif.

During World War II, Westinghouse developed a wire "umbrella" to shield vital explosives plants and oil-storage centers. When thunderstorms threatened prior to this, munitions executives dismissed their workers, crossed their fingers and prayed that they wouldn't get a direct hit. The new device increases protection several hundred percent.

By charting lightning strokes, engineers

have discovered that every 50 miles of power lines in the United States are hit by lightning on an average of 50 times a year. Each stroke has a potential voltage of between 20 and 30 million volts.

With this information, research men have been able to build equipment that will prevent lightning strokes from short-circuiting transmission systems and disrupting electrical service. Remember a few years ago when the lights in your home flickered or went out during a thunderstorm? Today, properly designed power lines are likely to be put out of service only once every five to ten years.

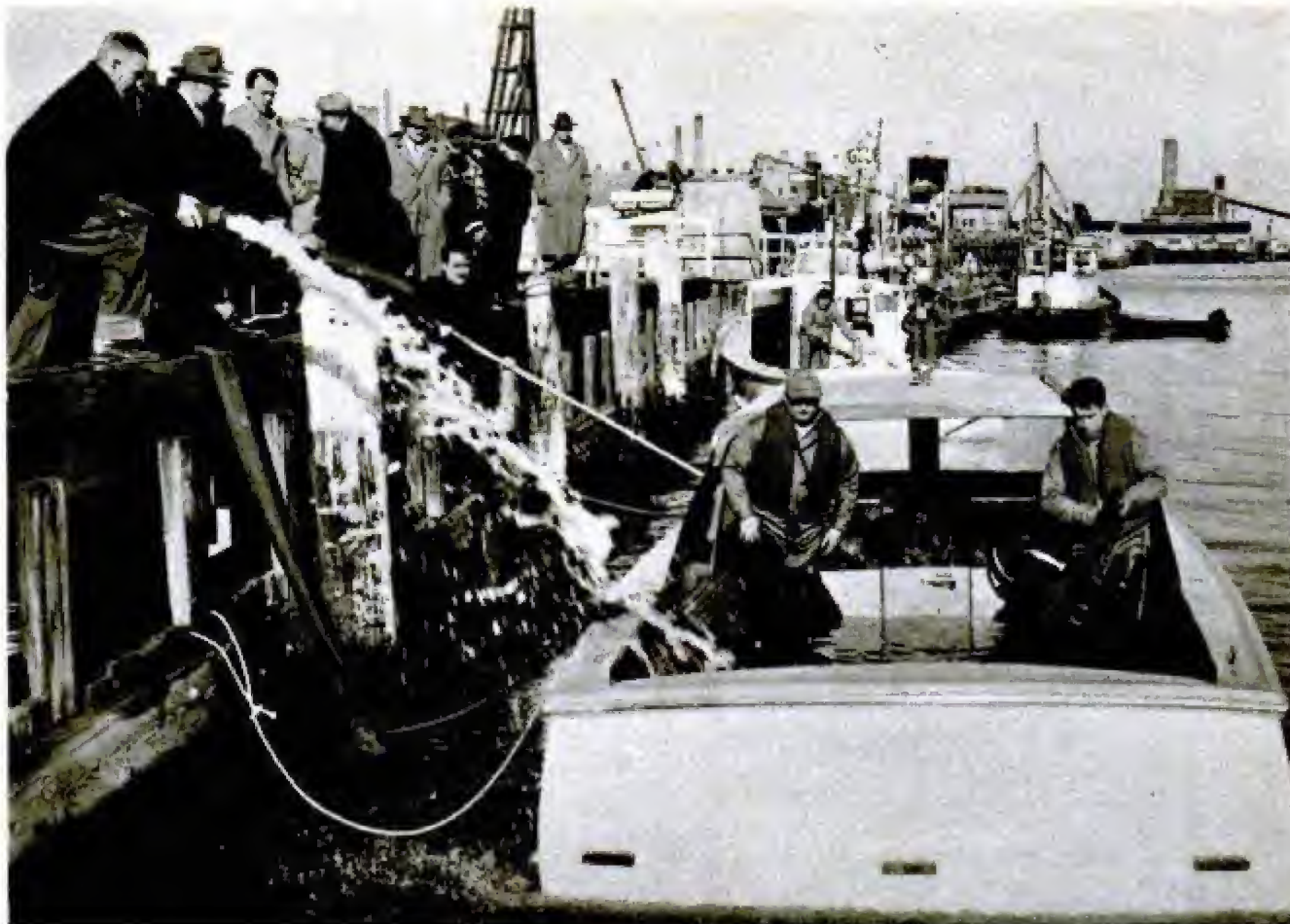
The most effective defense is the lightning arrestor which protects power-transmission, telephone and telegraph circuits. One of the newest types sends the lightning down and around a "spiral staircase" to dissipate its energy. It's more efficient, less costly to install and easier to maintain. For use on a 230,000-volt power line, the new arrestor stands 10 feet high.

At Westinghouse's Trafford laboratory, a three-foot model of a 32-foot cabin cruiser

(Continued to page 222)

Lightning left this lacy pattern on grass, proving it is positive. Negative stroke would form round pattern





Nonsinkable Boat

Water by the thousands of gallons can be pumped into a new nonsinkable cabin cruiser and will run right out again. The craft was designed as a government patrol or utility boat but will be available in pleasure-craft models. Water pumped into the boat rises to a height of 18 inches in the cabin section. When it reaches this point

it runs out wide scuppers in the after end of the self-bailing cockpit. Even if the scuppers are plugged, the craft stays on an even keel with three feet of water in the hull. The secret of the boat's buoyancy is a pair of steel air tanks built under the cockpit deck. The power plant is encased in a steel watertight compartment and the boat can be operated under its own power even when the engine is deep under water.

Remote Control Permits Lift-Truck Operator to Raise Self



Drivers of lift trucks can now stand on a pallet and operate the lifting mechanism by remote control. Available as an attachment, the device permits the operator to remove stock from hard-to-reach bins. The control unit clamps over the tie bar when not in use and its cable, housed on a retractable reel under spring tension, cannot become entangled.

Sources of supply for available products described in this issue are listed in the index starting on page 12. Sources of further information on other articles in the magazine are listed in the WHERE-TO-FIND-IT LIST, which is available without charge from Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario St., Chicago 11



Test truck makes hundreds of wrenching turns in the figure-eight test. Outrigger prevents it from rolling over

Truck Proving Ground

Going nowhere, there's a fleet of trucks rolling 24 hours a day around a 7¼-mile paved track in Arizona to pile up a total of 34,000 miles a week. It's all part of the test program for International trucks. In addition to the paved track, there are a four-mile dirt track and a number of special test areas, including a series of steep grades and a strenuous figure-eight test course. An

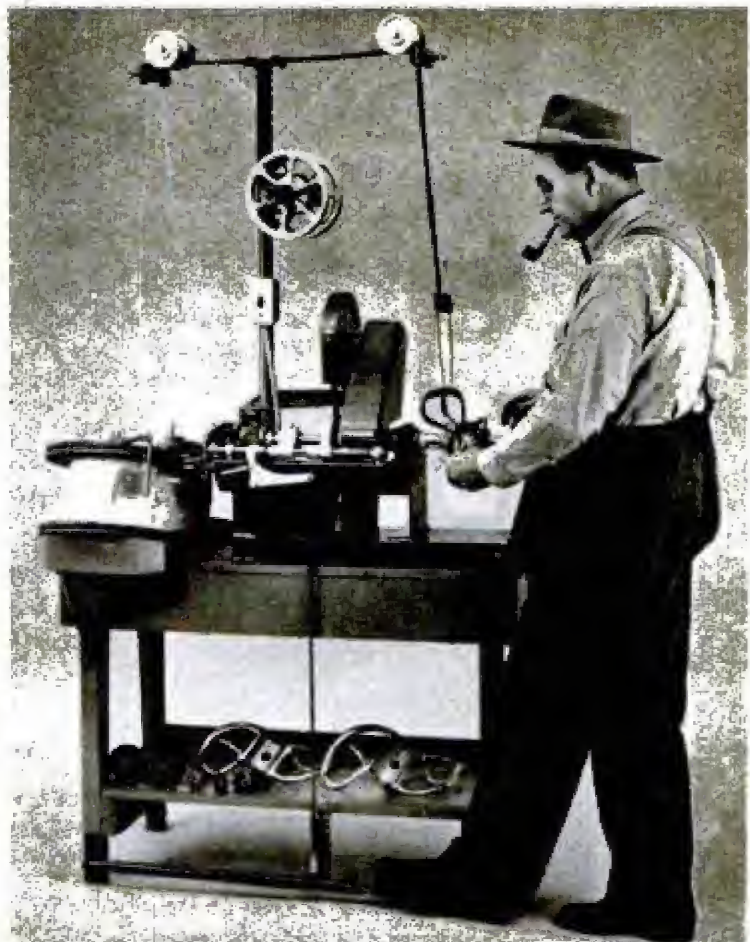
air-cleaner test area subjects the trucks to extremely abrasive road dust. Usually, about 30 trucks drawn at random from production lines are undergoing tests at one time. Temperatures in the area have a 100-degree range. A long nine-percent grade was manufactured on the desert proving ground to provide a test run for the complete gear range. More than 130,000 cubic yards of fill were required to produce the long, even grade.

Generator Armatures Wound in Two Minutes by Machine

Experienced operators can wind generator armatures in two minutes with a compact winding machine that is powered by a small electric motor. Normally, a skilled worker requires 30 minutes to wind an armature. The machine handles all standard automotive armatures except those of starter motors. The six leads are held out by the machine while the final turns are being made so they are accessible when the job is completed. An automatic tensioning device controls the feeding of wire from supply spools.

Record Iron Production

Record quantities of iron were produced in the United States last year. Lake Superior mines yielded 80.7 percent of the more than 130 million net tons produced, with Western mine output increasing to 9.3 million net tons. In addition, 11.4 million net tons were imported, principally from Chile, Sweden, Canada, Brazil, Venezuela, Algeria, British West Africa, Mexico, Tunisia and Liberia.

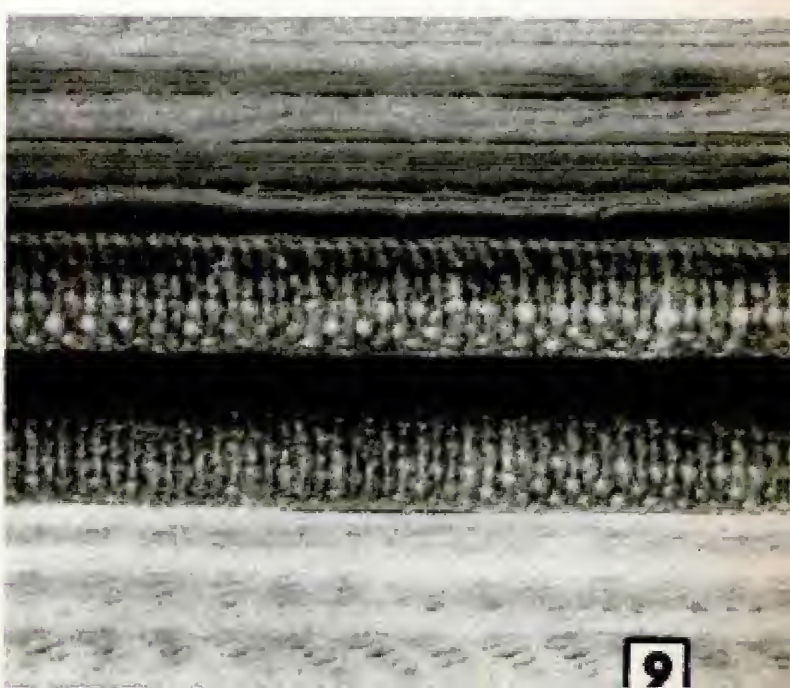
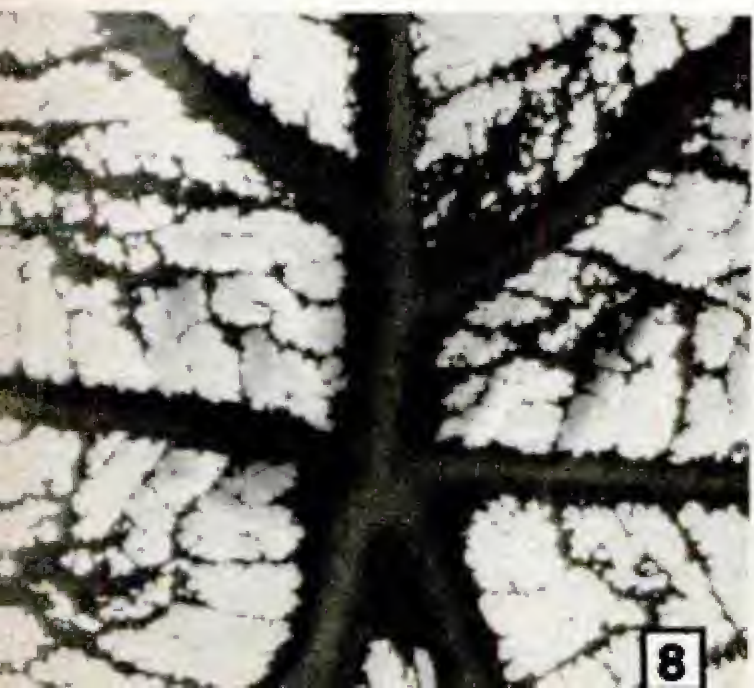
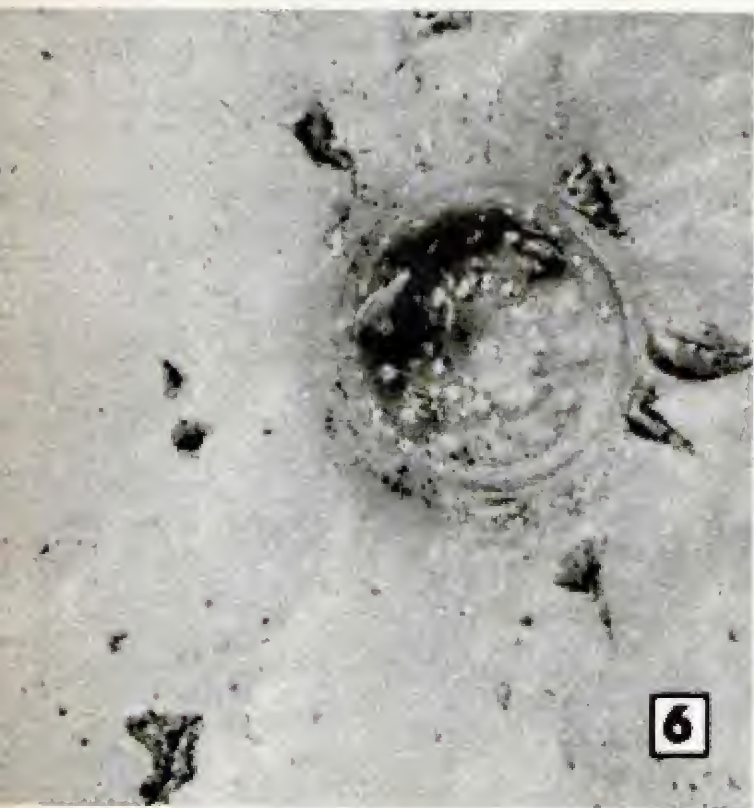
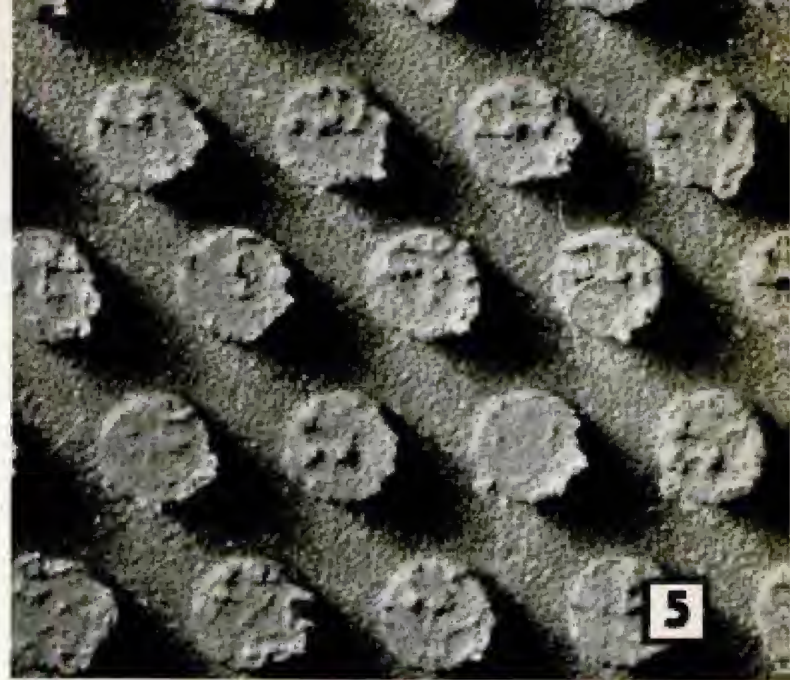
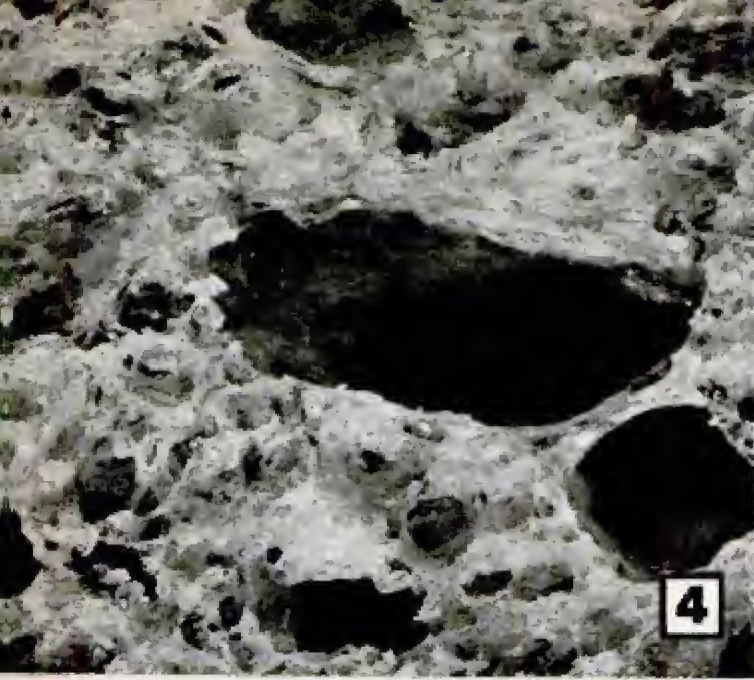


You Name It!

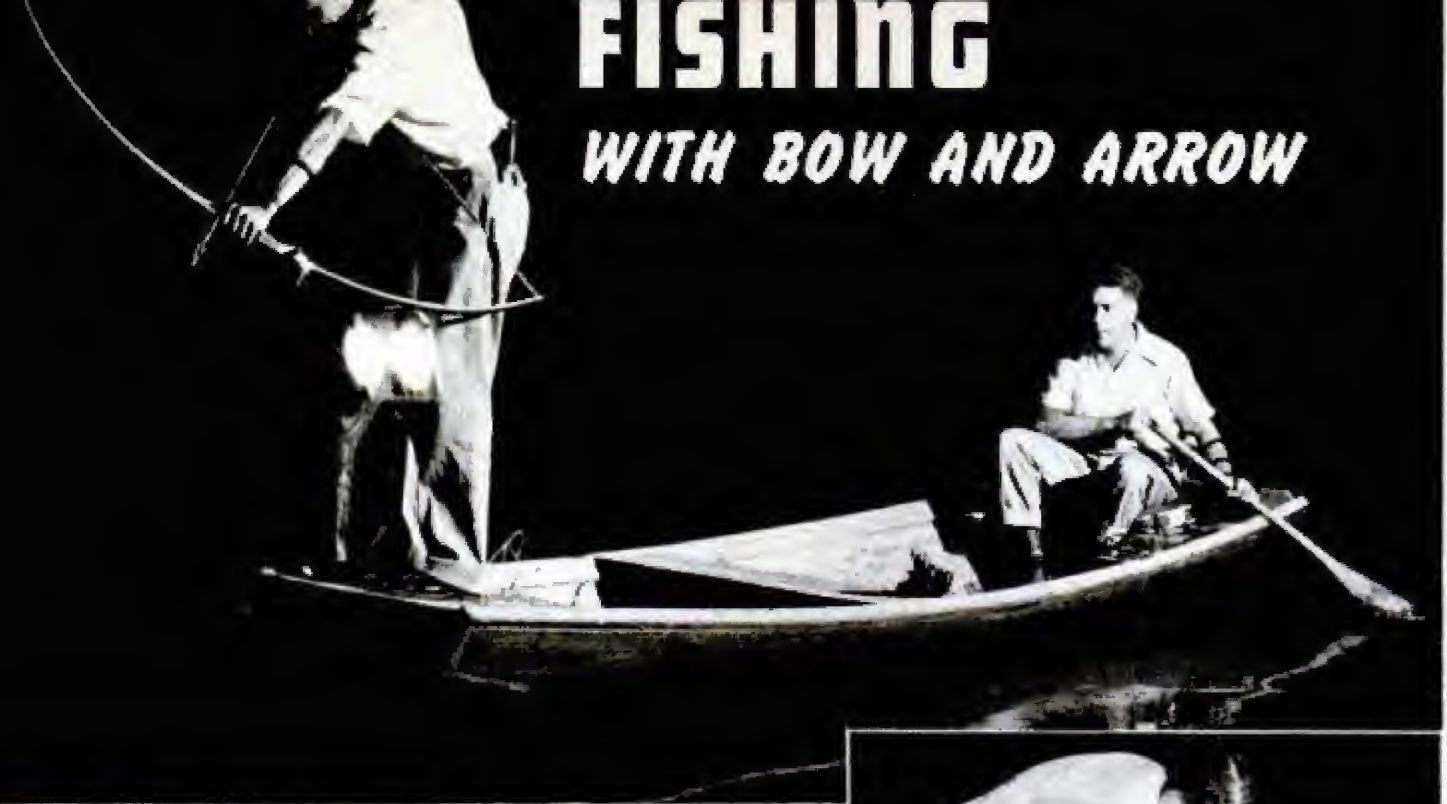
Things are not what they seem. Take a look through the camera's eye and sometimes even the commonest objects appear strange and weird. . . . See how many you can identify, then check your list with the answers on page 222

1.	_____
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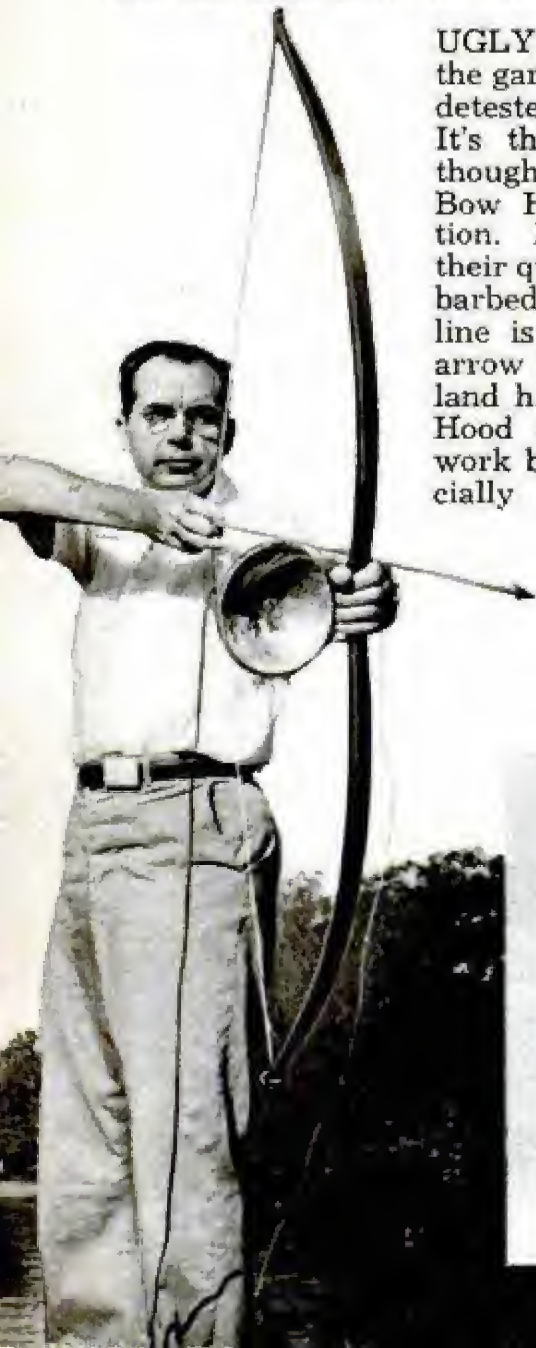


FISHING WITH BOW AND ARROW



St. Louis Post-Dispatch photos

Bow drawn, hunter watches for shadowy outline of gar to cross light beam. Below, one hunter clamps light to bow



UGLY and unpalatable, the gar is a predatory fish detested by most anglers. It's the special target, though, of the Arkansas Bow Hunters' Association. Members harpoon their quarry at night with barbed arrows. A nylon line is connected to the arrow so the hunter can land his fish. The Robin Hood anglers do their work by the light of specially rigged headlights.



When the hunter gets a bull's-eye he drags in his fish with a nylon line attached to the arrow. Below, a few of the heavily barbed wood and aluminum arrows the archers use. The one in center has a hinged barb that opens after a hit



Ride 'em, LUMBERJACK!

By Rafe Gibbs



RIDE IT, Larry!" megaphoned a spectator with cupped hands at the annual rodeo held in Orofino, Idaho.

Larry Nelson was not aboard the hurricane deck of a bucking bronco. He was maneuvering his feet nimbly on a whirling log to avoid a ducking in the improvised pond set up in the center of the loggers' rodeo grounds.

In the Pacific Northwest now when you say "rodeo" you must differentiate between the horse-bucking and saw-bucking varieties. The town of Orofino, wrapped in the timbered mountains which today form the world's greatest stand of white pine, holds one of the country's top shows annually during Lumberjack Days. It's four

With more than a half century in the woods behind him, this old-timer is still a sharp man with an ax

Quick stop, and under he goes! In Idaho, even youngsters learn birling. One of rodeo's feature events is for boys





Older "jacks" usually win this contest. Trick is to roll logs down the skidway without knocking over iron spikes

hours of fast action by men of the timber.

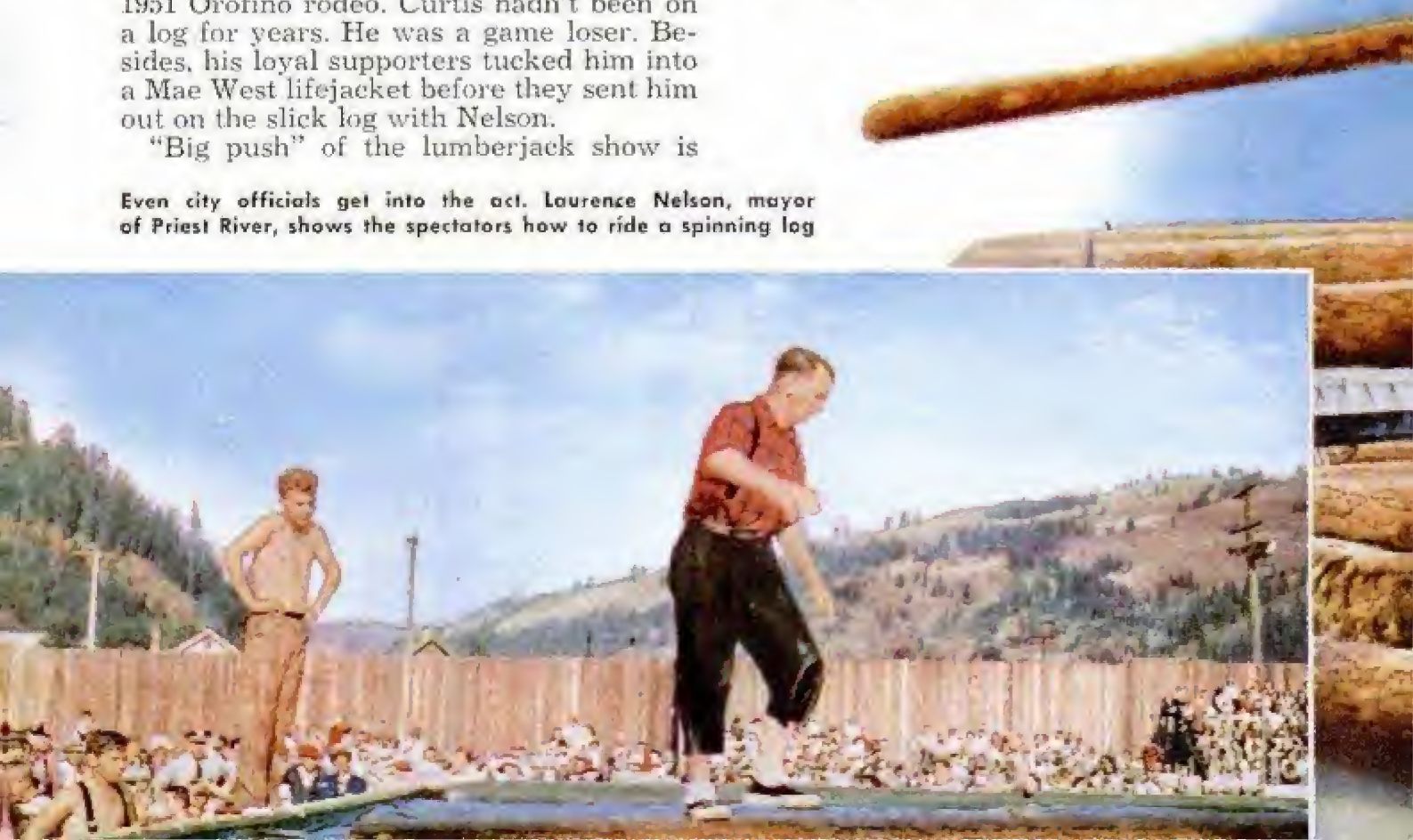
Stocky, well-muscled Nelson, who is mayor of Priest River, Idaho, is also a grade-A white-water man who clings to a spinning log like a wood tick. He challenged big Bert Curtis, mayor of Orofino and chief warden of the Clearwater and Potlach timber protective associations, to a special birling contest as a feature of the 1951 Orofino rodeo. Curtis hadn't been on a log for years. He was a game loser. Besides, his loyal supporters tucked him into a Mae West lifejacket before they sent him out on the slick log with Nelson.

"Big push" of the lumberjack show is

Even city officials get into the act. Laurence Nelson, mayor of Priest River, shows the spectators how to ride a spinning log

Melvin Snook, logger and state senator. "To watch a loggers' rodeo is to watch the story of logging itself," Snook told us. "You note, for instance, that the most skilled men on a bobbing log are generally older lumberjacks and that the fastest operators of a modern power saw usually are younger 'jacks' born to the mechanical age."

Birling, which is one of the oldest of lum-



berjack sports, appears simple—from the dry side lines. Two men step on a floating log and try to spin each other off. But there are intricate reverses, quick stops and quicker starts, twists and turns that require plenty of know-how. Different kinds of logs, too, call for different techniques. A pine, for instance, has a different roll from a spruce.

Winner of the 1951 birling contest at Orofino was 60-year-old Harry Shepherd of St. Maries, Idaho, who wrote new chapters to the book of birling as he pivoted on the buckskin (a peeled log). Shepherd's hair is as white as a snowshoe rabbit in winter but on a log he looks young. In fact, as he skipped and twisted he showed all the grace of a dancing master. He sent his first three opponents splashing into the drink without even getting his own feet wet.

Old-timers tell about two evenly matched jacks who went at it all day, knocked off for dinner and supper and finally quit—still dry—when clouds erased the moonlight.

Birling contests are a natural outgrowth of the business of riding logs down the river. And in northern Idaho there is still

business to be done. Come spring and high water, logs are floated down-river to feed the Potlatch Lumber Company's giant mill at Lewiston.

The jacks and logs of this part of the country have been used in the filming of Edna Ferber's epic *Come and Get It* and other logging movies. Although truckers pretty much have displaced river rats in most parts of the country, northern Idaho still boasts men who can ride the timber through white water and green. They are lured to Orofino during Lumberjack Days like bears to a honey tree.

Some of the kids around Orofino are pretty good on a log, too, because grandpa shows them how it's done at the old swimmin' hole on the Clearwater River. One of the birling contests at the rodeo was for boys only.

Maybe it was the kids who taught grandpa a new trick. For years, birlers counted heavily on calked boots to keep them on a log. But now even the old-timers are shifting to rubber-soled tennis shoes—same as the lads wear. Among the birlers at Orofino, there were only two who wore boots

Though old-time jack is still king of the rodeo, mechanical equipment is replacing him in the woods. Here a big loader juggles 32-foot logs





Jacks are only as good as their tools so old-timers continually sharpen saws, whet axes to knife edges

with spurs on the soles. Champion birler Shepherd? He wore tennis shoes.

Another contest in which the old-timers have the edge is the "tail down." It's a race against time in rolling three logs of different sizes down a skidway. The logs must pass between spikes placed at the sides of the skidway without knocking over one spike. This calls for expert maneuvering of the rolling logs with a peavey.

"The old boys usually shine at this because a lot of the younger jacks have never



Finest load of logs of the year, scrubbed to catch the eye of a woodsman, is auctioned off during rodeo

had to prod a log down a skidway into a river or flume," explained Don Fridley, rodeo official. "Logs now usually are removed from the woods by loading them on trucks with mechanical equipment."

A giant mechanical loader with a swinging crane was demonstrated at the rodeo. It picked up 32-foot logs and laid them on a truck without a log being touched by hand. The demonstration of speed and power would have drawn plaudits from Paul Bunyan and turned his blue ox green but,

Event for the lumber "jills"—gang-sawing with a crosscut. Winners say housework keeps them in top shape!



oddly enough, king at the rodeo was the jack with the simplest of all woods tools—the double-bitted ax.

No pet golf club, baseball bat or fishing pole is more highly prized or better cared for than the ax of the lumberjack. Many a jack has gone to bed with his ax tucked in beside him.

The axes at the rodeo were shining bright. They came wrapped in buckskin or flannel so the fine edges, put on through many hours of touching up with a whetstone, would not be lost in a moment's juggling in the back end of a car.

"Can you shave with it?" a man asked 73-year-old Fred Fuger as he carefully thumbed his ax—as much a part of him as his big gold watch.

"Well now, I can and I have," said Fuger. "But I don't put a shaving edge on it when I'm going into a wood-chopping contest. Too fine and too easy to chip. About knife sharpness is right."

The experts at Orofino point out that most people who chop wood use the wrong technique—all arm and no leg play.

"Chopping wood is better exercise than swimming—if it's done right," commented W. O. Donner. He spoke with authority for he has been chopping wood for 33 years. At 58, his body still is tapered like a college athlete's.

"Man's got to put his whole length into each whack," said Donner. "Let the swing start at the feet and work its way up. Develop a rhythm. Take the same stroke each time."

The legs of most athletes go first. So, too, with lumberjacks. Only their legs usually don't go as fast, for instance, as do those of boxers.

Some of the ax-swinging jacks at Orofino are in their 60s and 70s but their lower limbs are still as sturdy as those of a hickory. But you also can see a tremble starting in some legs. And, even though the arms still swing mightily, you know that when the leg tremble starts the finish inevitably must follow.

As gray-thatched Fuger put it, "I don't expect to win any more in the contests that require strong legs. Just like to mix it with the boys. Take the tail-down contest, though. With the right breaks, I mighta won it. Folks say I'm the best little man with a struggle bar on the river."

The chopping contest was won, as the experts predicted, by a young jack named Delbert Roby from Kamiah, Idaho. He whacked through a log more than a foot in diameter in 1 minute and 14 seconds. If you think that isn't fast time, try to beat it.

Meet All-Around Champion Delbert Roby. Master of ax and saw, he was crowned mightiest man of woods

Roby has both sturdy arms and legs. In fact, he's plain sturdy all over. At 27, he is a trim 170 pounds—same weight he had when he first entered the woods at 16.

He went on from the wood chopping to gain enough points to be crowned All-Around-Champion Lumberjack. His strongest events were with the power saw—but the power saw didn't come easy to him at first.

During World War II, Roby took time out from the woods to serve in the South Pacific as a paratrooper.

"When I came back in '46, things had changed," said Roby. "Power saws—that's what everybody was talking. I didn't understand 'em so I sharpened and oiled my old crosscut. But I soon saw I was behind the times and behind in money making. I switched to the power saw. At first the saw seemed heavy and hard to handle. But I kept telling myself I had parachuted with more weight on my back. Once I got used to the power saw, I more than doubled my output."

There are jacks in the woods today who make more than \$1000 a month with a power saw. Recently a jack serving on a jury in Orofino lost more income during the trial than any of the other 11 good men and true. The high earnings of some of the experts are due to the pay scale based on output with a crosscut.

Not all jacks, however, are turning to the power saw. Take Jack Kearns, 66, for instance. He has been logging for more than a half century. Starting in New York State





In this event four husky arms and shoulders aren't nearly as important as teamwork learned in the woods

at 15, he moved to Michigan in the boom days there. When the logging scene shifted west, he came to Idaho. He's always used the ax and crosscut.

"Guess I'll keep on till I'm too old for the woods," said Kearns. "I might switch if my legs were stronger. Funny thing, I can walk better on a pond now than I can on a sidewalk."

The weight of the power saws, which has bothered some jacks, is being whittled down. The saws, which have blades on a moving chain and are operated by a gasoline motor, come in three primary sizes—three, five and seven-horsepower. The three-horsepower now has been trimmed to less than 25 pounds. Even a seven-horsepower weighs only about 55 pounds.

"The secret in cutting timber fast with a power saw is not to overload the motor," said Roby. "The motor should always be kept at full power. The cut should be even and clean. With a power saw, you don't need an ax to do the notching in felling a tree. And you undercut the notch instead of overcutting it. That makes for a more even break. Too, with a power saw, you can work in tighter places than with a crosscut. Takes up only about half the space."

Roby took second in the saw-bucking, which is pushing a crosscut by your lonesome. Then he teamed up with attractive Dorothy Roby in the Jack and Jill contest with a crosscut. They took first.

Next came the power-saw events in the

(Continued to page 216)

In the power-sawing contest, wood cakes for the legendary Paul Bunyan are sliced expertly off the log





Detroit Listening Post

By Siler Freeman

CHRYSLER this month starts tapering off production for the earliest change-over since the end of the war. The various divisions will wind up 1952 schedules and, come another month or so, new and different models will begin to emerge from the lines.

The Chrysler cars will be more changed than perhaps any time in the company's history. For one thing, the Imperial and New Yorker models will be quite a bit shorter. The Saratoga, the short-wheelbase member of the Chrysler eight-cylinder line, will be dropped. The Windsor will be the "small" car of the line.

Chrysler will kick off what is probably the most intensive model changeover in many years for the industry. Before the year is out, the customers will be offered better engines, greater fuel economy and easier driving.

Why all this furor when sales have been good and production restricted? Because competition is back and even the sales managers are admitting it. Mere order taking is over and it is now a battle for buyers with all of the salesman's art called back into play.

The customer will get a break in more than one way on his 1953 model. Not only will he be offered something other than a face-lifted model but he will get a better choice of what he wants to go along with it. No longer will he have a Super De Luxe pushed in his lap when all he wants is just a standard car. Accessories will be his own choice—not those on which the factory and dealer can make the biggest margin of profit.

More and more it becomes apparent that the automobile business is returning to normal. Even before the new models come out, some of the manufacturers have seen the light and are honoring orders as they come from dealers. The high ratio of these so-called de luxe cars will go down as the buyer climbs back into the saddle.

On one score, however, relief doesn't seem around the corner for the customer and that is on price. No one can promise that tags will come down in the foreseeable future. Because the car makers are pour-

ing a lot of money into body dies and transfer machinery to make V-8 engines, and because the costs of labor and materials are drifting higher, reductions will be rare.

On the other hand, with competition ahead appearing stiff and the drive for sales bitter, there can be no important price increases on the new models as this would defeat the goal the industry has set—another big year for production and sales.

There is a glimmer of hope. The dealers have been vociferous and aggressive in their efforts to preserve their historic markup on cars, which usually runs in the neighborhood of 24 percent. They have told the factories through their dealer councils they will fight any attempt to shave their discounts. Why? Because they too recognize the sign that normalcy is returning.

The result of the ever-increasing cost of new automobiles has been a notable downgrading of buyers; a Dodge customer takes a Plymouth, a Buick prospect becomes a Chevrolet buyer. Certain accessories are hardly ever passed up, such as heater, radio and direction signals, while windshield washers, foam-rubber upholstery and fancy seat covers are snubbed.

On the other hand, the trend to such high-cost items as power steering and automatic transmissions is not being turned aside. At least one more company will offer power steering to its buyers before the year is out. Buick has extended it to its Super series. Dodge, embellished with a new V-8 engine for 1953, will get the Chrysler-type power steering. It is already in the Chrysler and DeSoto lines.

An important change may come in the power-steering devices. Both Gemmer, which makes Chrysler's power steering, and Saginaw steering division, which makes General Motors' version, are looking into an electrically operated unit.

The argument against the hydraulic device is the possibility of leaks, which would destroy its effectiveness. Of course, there is never a steering failure when the power unit goes out because in both the Chrysler and G.M. versions the regular steering unit takes over at once.

I am the owner of a 1952 DeSoto, Deluxe Custom Fire Dome Eight
 It is equipped with: Conventional trans. (Fluid Drive) Tip-Toe Shift
 Fluid-Torque Drive and: Hydraguide Power Steering Power Brak
 I have owned it approximately 2 months. Speedometer mileage is n
 Having tried both kinds, I find that my DeSoto operates satisfactorily using:
 regular gasoline premium (high test) gasoline
 My average gasoline mileage is 14-15 m.p.g. for city driving, and
18 m.p.g. for country driving.



I CHANGE OIL every 2000 miles.
 I change oil every _____ miles, but also ADD OIL every Do not add oil.

Roadability and handling qualities are: Excellent Good Unsatisfactory
 Maneuverability in traffic seems to be: Excellent Good Unsatisfactory
 Acceleration is: Exceptional Very Good Average Poor
 Curb and road clearance is: Satisfactory Too High Too Low



Here are my main reasons for purchasing a DeSoto: This is my 3rd D
good service, low maintenance cost, reliability

Particular features I like are: The body styling in general Oriflow shock absorbers
 Chair-height seats Quality of interior finish, upholstery, etc. New
 color combinations New "Air-Vent" hood treatment

Specifically, what do you dislike about your DeSoto? Power steering has too much
back-lash, chatters on country road.



Have you ever owned a DeSoto before? Yes No How many? 2

Would you buy another DeSoto? Yes Possibly No

How do you rate your dealer service? Excellent Good Average

How do you rate your DeSoto, generally? Excellent Good Average

GENERAL INFORMATION

What type of engine would you prefer in your next new car? In-line V-type

Number of cylinders: 6 8 Valves: Side Overhead

Are you satisfied with the horsepower rating of your DeSoto (146 or 160)? Yes

Approximately what H.P. rating would you prefer in your next new car?
 What improvements would you like to see in your next car? Quiet the back
in the power-steering unit.

Based on your present experience, which transmission would you prefer?
 Overdrive Tip-Toe Shift Fluid-Torque Drive Other type automatic

This questionnaire will be tabulated fairly, and your name will be held in strict confidence. We request that you attend to each question listed. Thank you.

Please mail promptly to:

FLOYD CLYMER
 1268 SO. ALVARADO ST.
 LOS ANGELES 6, CALIF.

My Name: _____
 Address: _____
 City & State: Minnetonka, Minn.
 Occupation: State Man

(Please write your personal comments on reverse side.)



The '52 DeSoto owner who filled out this questionnaire was just about average on gas consumption. Some of the new Fire Dome Eight models are at right



This Minnesota owner of a V-8 tells Clymer the most important feature of the car to him is power steering

THE OWNERS REPORT ON THE '52 DESOTO

The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1952 cars who answered questionnaires sent by *Popular Mechanics* to 1000 DeSoto owners from coast to coast

By **Floyd Clymer**

MOST CAR OWNERS have strong faith in the products of their favorite automobile corporation. A great many are avid Chrysler fans; of these, a substantial number favor DeSoto year after year over all other makes, as our owners' survey clearly showed.

Many agreed almost word for word with the West Los Angeles, Calif., sheet-metal worker who said: "The main reason I bought a 1952 DeSoto was because I believe Chrysler products are the best . . . the over-all picture of the car appealed to me." Other enthusiastic comments were similar to that of a Long Beach, Calif., salesman: "Can't think of any improvements right now—this is the most satisfactory car I have ever owned or driven."

A Roxbury, Mass., mailman wrote: "I have owned nine different makes since 1919 and I find this DeSoto the best of all." "The DeSoto is everything I want in an automobile—tough, economical, attractive, and it operates smoothly under all conditions," enthused a Durham, N.C., minister.

A school official in Clarksville, Tenn.,

observed: "The seats are good for posture. With finger-pressure steering, I am able to drive 600 miles in a day and not feel tired."

A frank answer to the question "Why did you buy a DeSoto?" came from a Chicago service-station owner: "Because I am lazy and it handles easily." Said a Carnegie, Okla., mechanic: "I am well pleased with my DeSoto. I believe it is a real car; it has the power and driving qualities of any bigger car."

"It can do everything but sit up and bark," remarked a Silver Spring, Md., woman accountant.

"Power steering (Hydraguide) is a dream and a great help to women drivers on long trips and in parking. This is my first DeSoto, but from now on it's DeSoto for me," said a Chino, Calif., housewife.

"After driving the DeSoto I doubt if I'll ever get a smaller car again. The smooth Fluid Drive is a new experience in driving for me," said a Des Moines, Iowa, pressman.

"I like DeSoto's Tip-Toe Shift because it gives you a choice of speed in shifting gears. It saves me from fatigue on trips,"



The new DeSoto Fire Dome V-8 engine produces 160 horsepower and is similar to the Chrysler 180-horsepower engine but on a smaller scale

Percentages From PM Poll

Owners of Custom and De Luxe models (6-cyl.)	68%
Owners of Fire Dome models (V-8)	32%
Owners having Tip-Toe Shift with Fluid Drive	81%
Owners having conventional Fluid Drive	15%
Owners having Fluid-Torque Drive	4%
Owners having Hydraguide power steering	17%
Owners having power brakes	9%
Average gasoline mileage in country:	
6-cyl. models	17.7 m.p.g.
V-8 models	17.1 m.p.g.
Average gasoline mileage in city:	
6-cyl. models	14.1 m.p.g.
V-8 models	13.6 m.p.g.
Use regular gasoline	62%
Use premium gasoline	38%
Change oil	100%
Average mileage for change of oil	1450
Add oil (also change periodically)	4%
Average mileage for adding one quart	930
Roadability excellent	81%
good	19%
unsatisfactory	0%
Maneuverability excellent	64%
good	35%
unsatisfactory	1%
Acceleration exceptional	23%
very good	37%
average	37%
poor	3%
<i>(Includes all models — 6-cylinder and V-8)</i>	
Road clearance-satisfactory	92%
too high	2%
too low	6%

BEST-LIKED FEATURES

Chair-height seats	81%
Oriflow shock absorbers	69%
Body styling in general	56%
Interior finish, upholstery	38%
Paint and color combinations	31%
"Air Vent" hood design	26%

(These percentages are based on answers to direct questions asked in questionnaires)

OWNERS' RATING OF CAR

Excellent	59%
Good	30%
Average	10%
Poor	1%

GENERAL INFORMATION

Owners preferring the following on next new car:

V-type engine	67%
In-line engine	33%
Eight cylinders	63%
Six cylinders	37%
Overhead-valve arrangement	71%
Side valve location	29%
No increase in horsepower output	90%
Average horsepower output desired	140
<i>(Respective DeSoto horsepower figures—116 and 160—were tabulated for those owners who expressed satisfaction with present horsepower ratings)</i>	
Automatic-transmission unit	87%
Conventional transmission with overdrive	10%
Conventional transmission only	3%
Tip-Toe Shift with Fluid Drive exclusively	52%
Tip-Toe Shift with Fluid-Torque Drive	31%
Other type of automatic transmission	17%

(Percentage of the 87% preferring automatic-transmission units)

Previous DeSoto owners	52%
Have owned five or more DeSotos previously	17%
Will buy another DeSoto	64%
Might buy another DeSoto	34%
Will not buy another DeSoto	2%
Dealer service rated excellent	51%
good	25%
average	20%
poor	4%

Most frequent objections:

1. Slow shifting of gears in automatic transmission
2. Lack of acceleration, power (6-cyl. models)
3. Body fitting, assembly, styling

Improvements desired in next new car (in order of preference):

1. New body styling
2. Increased gasoline economy without sacrificing power
3. Better body assembly and tighter construction
4. One-piece windshield design
5. Increased acceleration and power
6. Quicker-shifting automatic transmission
7. Easier steering—power-assisted or otherwise

Main reasons for purchasing DeSoto:

1. Previous satisfactory ownership
2. Mechanical features—engine, transmission
3. Styling features—interior, exterior
4. Riding qualities, comfort of seating
5. Reputation of Chrysler Corporation
6. Roadability, driving ease, handling qualities

(The above percentages represent unsolicited comments. Some commented on more than one feature)



Clymer found the DeSoto V-8 to be one of the fastest stock sedans that he has tested. Body styles of the Six are same as the V-8



Cowl extends far down and forward directly above passenger's feet—a feature Clymer does not like

was the opinion of a Cleveland, Ohio, draftsman.

Naturally, some DeSoto owners have their pet peeves and dislikes about the car:

"The DeSoto has a very slow getaway with automatic transmission in high range. . . . In my case the dealer service has been terrible."—Chicago machinery assembler.

"The styling needs more flair."—Greensboro, N. C., salesman.

"They should remove the hump from the floor in front or depress it."—Jersey City, N. J., production manager.

"The front seat at the wheel throws the driver into an uncomfortable position, or else he rides at the extreme rear of the seat."—Harrisburg, Va., court reporter.

"Chrysler products have little eye appeal, no over-all beauty."—Roanoke Rapids, N. C., jeweler.

"For \$3000 I expected more value. Not getting it, I am disappointed; particularly when the car is falling apart."—Baltimore, Md., attorney.

"I don't think this car should be in the shop so much, considering its cost."—Denver, Colo., airline pilot.

"The price of the car and others in its class is about to force me into the smaller-car bracket."—Richmond, Va., salesman.

"I dislike the fact that I can depend only on the hand brake when parking, especially in parking on a grade."—Torrington, Conn., toolmaker.

"The Fluid Drive plus Tip-Toe Shift is absolutely no good. You can't buy a DeSoto with conventional transmission and overdrive."—Detroit truck driver. [Yes, you can, says DeSoto. Conventional transmission and overdrive are available on Custom and Fire Dome 8 models.]

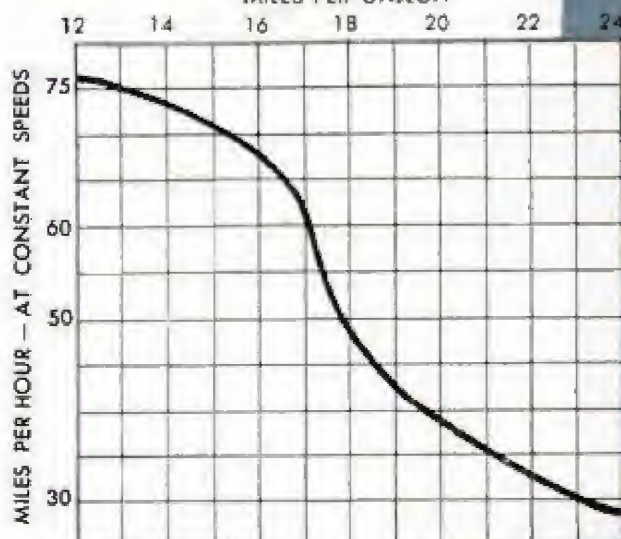


Clymer approves of DeSoto's big and convenient doors. He also likes hand holds to aid passenger

"I was told I would get anywhere from 14 to 16 miles per gallon in the city and 18 to 20 in the country and it hasn't come near this."—Lake Worth, Fla., fireman. [DeSoto won Class E in the recent A.A.A. Mobilgas Economy Run—1415 miles from Los Angeles to Sun Valley, Idaho—averaging 21.2777 miles per gallon at 40 miles per hour average speed.]

Economy Test

1952 DeSoto Fire Dome V-8
Tip-Toe Shift — Fluid-Torque Drive
MILES PER GALLON



"The car has good economy for its size and horsepower," says Floyd Clymer, who backs his statement with this economy test made at varying speeds. A DeSoto V-8 won first place in Class E in the 1952 Mobilgas Economy Run from Los Angeles to Sun Valley, Idaho (1415 miles), with 54.7368 mpg and 21.2777 actual mpg. The average speed of all the competing cars in the race was 40 m.p.h.



Acceleration Test

1952 DeSoto Fire Dome V-8
Tip-Toe Shift — Fluid-Torque Drive

¼ mile
from zero

21. seconds

½ mile
from zero

32.50 seconds

0 to 30
m.p.h.

4.70 seconds

0 to 60
m.p.h.

15.20 seconds

All tests for acceleration on the Fire Dome V-8 were made starting in top gear with Fluid-Torque Drive. Top speed by speedometer was 107 m.p.h. (actual top speed was about nine percent less)

DeSoto windshield comes in two pieces but offers good vision; all the controls are within easy reach

"The car was delivered with the wheels improperly balanced." — Nashville, Tenn., mechanical engineer.

Quite a few owners—such as a Durham, N. C., tailor; a Muskogee, Okla., oil driller; and a Kensington, Conn., machinist—said they would prefer a one-piece curved windshield instead of the present two-piece shield.

The National Broadcasting Company will be glad to know that at least one owner said he bought a DeSoto because of the Groucho Marx show.

Here are some more random comments:

(Continued to page 240)

Below, Clymer makes a fast short turn aided by the power steering on test car. Only takes two fingers





Largest Military Helicopter Carries 20 Troops

Nearly doubling the load-carrying capacity of previous military helicopters, the new Piasecki Work-Horse is the largest ever built for the armed forces. Twenty armed soldiers can be carried on assault missions in the 52-foot fuselage. A cargo compartment 20 feet long is provided by folding the seats against the aircraft's sides.

Equipment too bulky to be loaded inside can be carried externally in a sling. A 1425-horsepower Wright Cyclone engine turns two coequal rotors at the front and rear of the fuselage. Piasecki is also building a 40-passenger helicopter that will have a detachable pod almost as large as a cross-country bus.

Parasol Hat

Made of bamboo and paper, a sun parasol that attaches to the head is popular at Japanese sporting events. It is eight inches in diameter and sells for 30 yen, which is about 10 cents in U. S. money. Some of the parasol hats carry printed advertisements.



Discover New Element in Stars

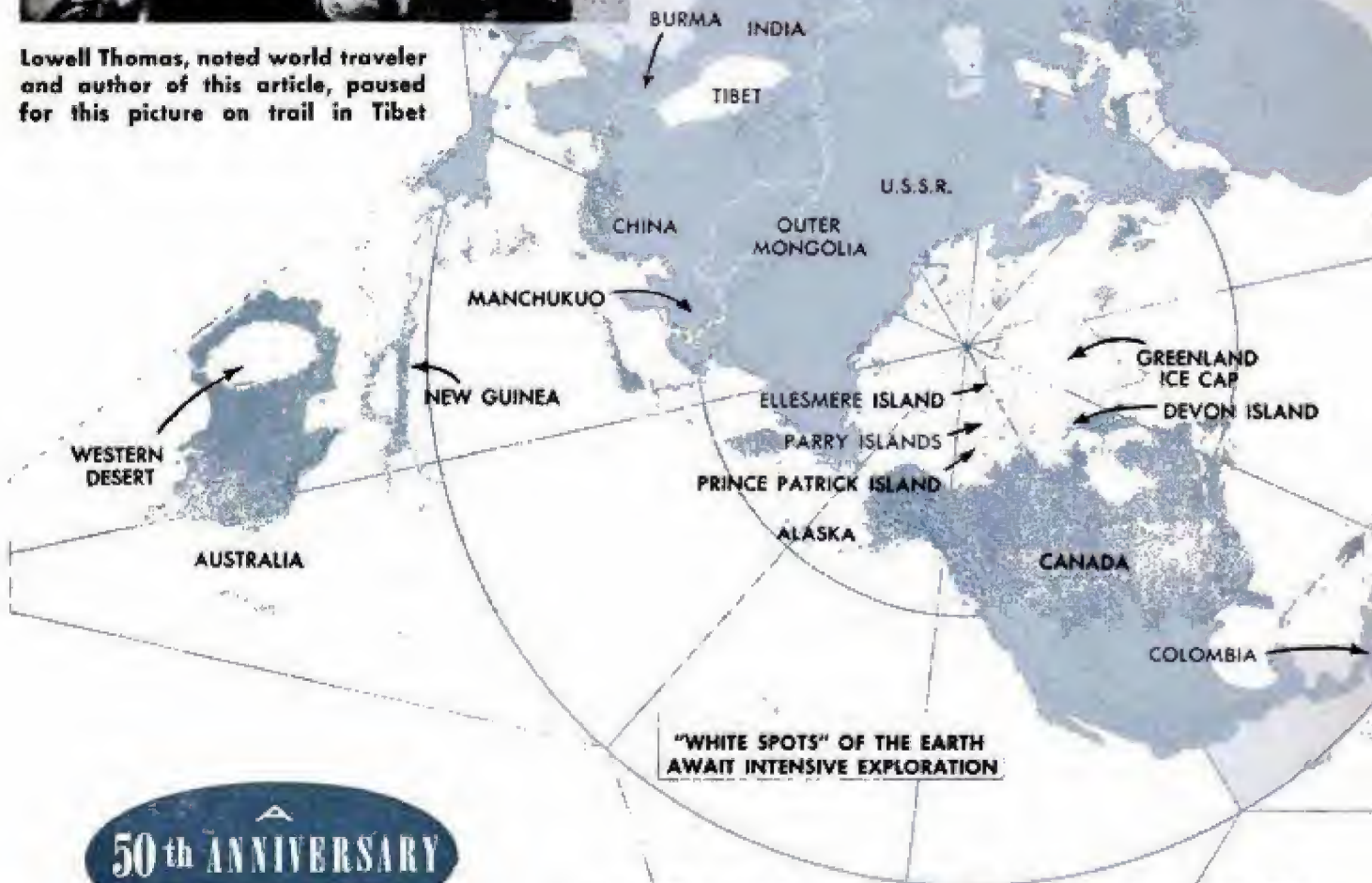
Technetium, the first chemical element to be discovered through atomic bombardment, is now known to exist in the red S-type stars. Photographs taken at the Mount Wilson and Palomar observatories show several technetium lines in the spectra of these bodies. This may indicate that there is a stable form of technetium. The type produced by bombardment is unstable. Known as element 43, it was first identified here in a piece of molybdenum that had been bombarded with neutrons in the University of California cyclotron. If the technetium in the stars is also unstable, it apparently means either that the S type of stellar existence is relatively short (mere hundreds of thousands of years) or that the little-known heavy elements of zirconium and barium in these stars somehow produce a continuous supply of technetium.

The WHERE-TO-FIND-IT LIST, available without charge from our Bureau of Information, 200 East Ontario, Chicago 11, lists sources of further information which are not given on pages 12, 14 and 16



Lowell Thomas, noted world traveler and author of this article, paused for this picture on trail in Tibet

The author indicates a few "white spots" on the map below awaiting further exploration, but he points out that future explorers will turn to space and deep seas



A
50th ANNIVERSARY
FEATURE

FIFTY YEARS OF

By Lowell Thomas

TWELVE streamlined Arctic-ized Navy ships slipped out of the Panama Canal harbor of Balboa one morning in December 1946 and swung south toward the "White Continent."

This—Rear Adm. Richard E. Byrd's fifth expedition to the Antarctic, Operation High Jump—was to be "exploration with a difference." Stowed in the hangar deck of the carrier *Philippine Sea* were a Navy helicopter and a fleet of the latest landplanes and seaplanes for photomapping the Antarctic icecap. Each plane would carry five cam-

eras—one pointed straight down, two at an angle of 30 degrees from the horizontal, and two focused on the instruments, one on the clock and the other on the altimeter. These three-dimensional photos could then be pieced together to give a perfect map of the icecap, its lofty mountains and chasms—a detailed map of areas where no human foot had been.

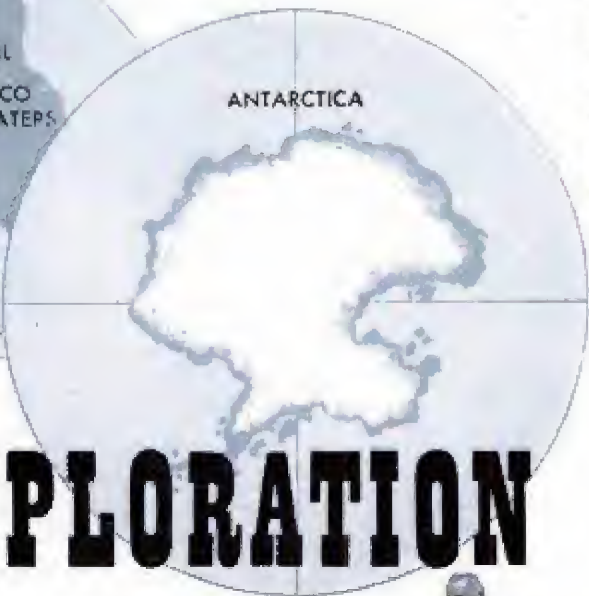
As the fleet edged its way into the first pack ice, the helicopter soared aloft to act as the "eyes" of the icebreaker *Northwind* leading the cavalcade of ships. A sub-



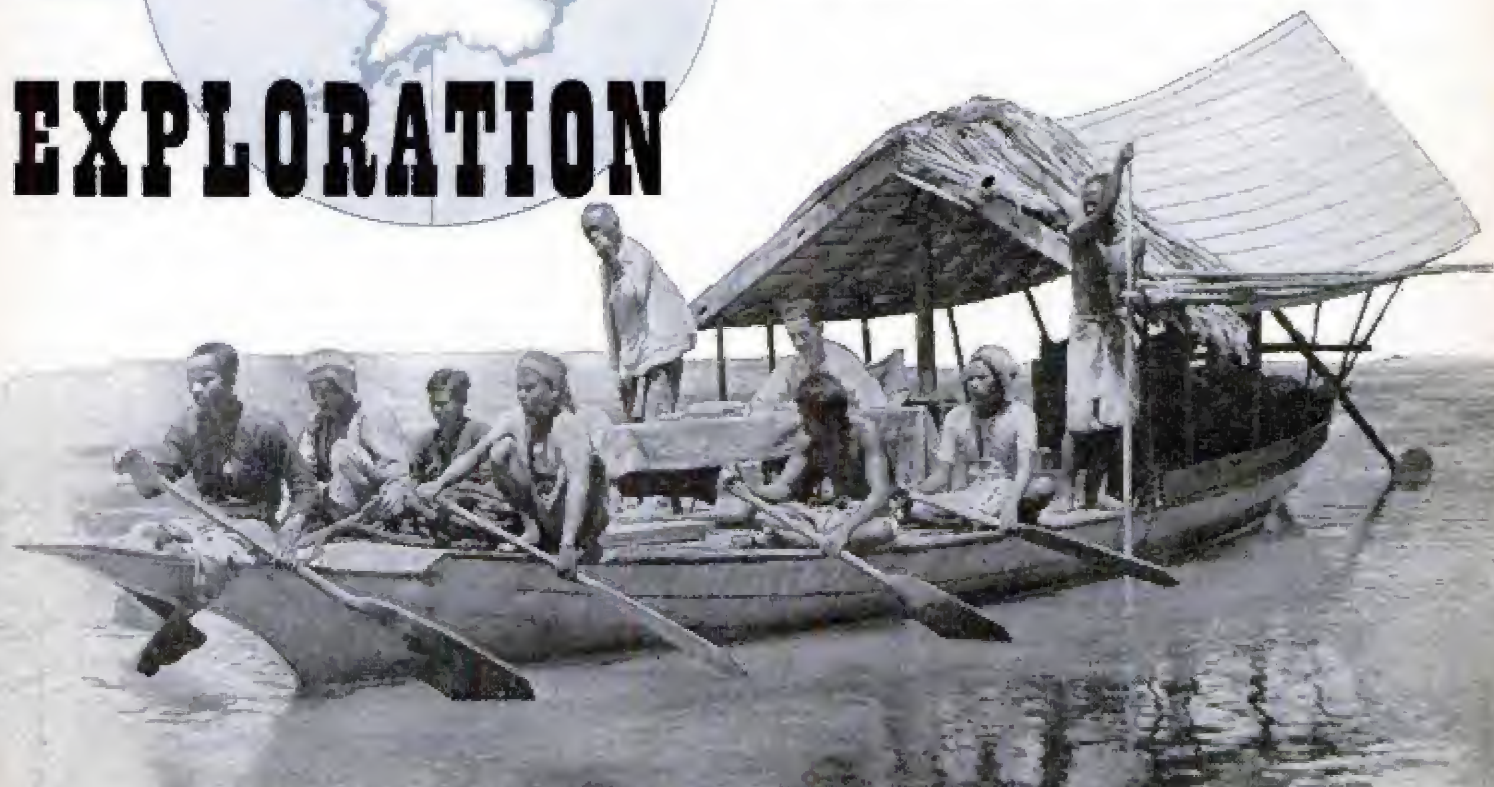
Lowell Thomas, Jr., holds microphone while he and his father make recording of a Tibetan monk blowing quaint ceremonial trumpet

marine, the *Sennet*, put out into the Southern Ocean to act as the expedition's mobile radio weather station. Aboard the ships were some of the latest wartime scientific devices to make life easier at Little America, base camp on the Bay of Whales. There were insulated prefabricated houses, Caterpillar tractor snowmobiles, ice tractors for drawing teams of sleds and a magnetometer—an instrument for mapping from the air the terrain under the polar ice fields. Personal comforts included polar clothing, snow goggles, electric blankets and even Christmas turkeys! "Modern steam-heated

While the crew paddles, author Thomas catches up on his writing aboard native craft while navigating the murky rivers of the Malay jungle



EXPLORATION





Peary upon his return from discovering North Pole in 1909. Right, Roald Amundsen at the South Pole in 1911, where he planted the Norwegian flag. This ended the great race to find the two Poles, which gained worldwide attention during the early 1900s. Lowell Thomas says explorers of today travel in luxury compared to the hardships endured by old explorers



Bettmann Archive photos

exploring," as one observer described it.

I was talking recently to Sir Hubert Wilkins, our top expert on Arctic clothing, about the special suits. He told me that the Arctic-equipped serviceman today carries 193 pieces of clothing which weigh 192 pounds! Wilkins' opinion is that the Eskimos were right in the first place. There is nothing to beat fur and skins. Hence, military researchers are hunting for a material that will resemble these skins. Their idea is to use air cells to provide an insulating vapor barrier.

All this is a far cry from the brave navigators who sailed uncharted seas in search of unexplored continents no more than a few decades ago, their crews ravaged by sickness, exposure and a diet of salty meat and moldy biscuits. Or, worse, the foot-slogging expeditions through tropical rain forests, ravaged by fever and plagued by hunger.

As I walk through the entrance hall of the American Geographical Society's home in New York, I am always struck by the tremendous advances in exploration since

the turn of the century when *Popular Mechanics* made its first appearance. On the walls before me are the names of illustrious men who have received the awards of the society — Scott, Shackleton, Peary, Amundsen, Byrd, Wilkins, Roy Chapman Andrews, Ellsworth, D'Abruzzi, to name only a few. There was no steam-heated exploring for these men in their endeavors.

Only a short 50 years ago the greatest ambition of every explorer was to be the first to reach the Poles — via crude sleds, dogs, their own legs and Eskimo clothes for protection. Eight times Robert E. Peary faced the icy winds of that northern waste and was beaten back. In 1909, he set out for his ninth and last try. Peary was 52—by no means young for Arctic exploring—and had lost all but two of his toes from frostbite. On the final leg of the 500-mile sledge trip, he battled fierce, icy gales across the ice. With him was only Matt Henson, his famous Negro companion who had accompanied him on all his previous attempts, and four Eskimos. Henson is an old friend of mine. I once asked him on a

broadcast why Peary should have selected him out of all his party for that epic trip? "Why," he said, "I was the only guy who didn't have frozen feet. Peary with his missing toes was half-frozen all the time!"

On April 6, 1909, they reached their goal—the North Pole conquered at last! The secret of Peary's success was his ability to live as an Eskimo. He built snow igloos, wore Eskimo seal furs and trapped the seals—a real Nanook of the North. Also, he had a team of rugged outdoorsmen like Henson, Donald MacMillan and Bob Bartlett.

As soon as the news of Peary's triumph reached the "outside," the eyes of the world were turned south. Within two years the race for the South Pole was on. It was Capt. Robert Falcon Scott, a British naval officer, who led the first streamlined spearhead into the White Continent. Scott's plans were to roar over the ice with the first motor sledges. Shetland ponies would carry his baggage. His ship, the *Terra Nova*, was loaded with knockdown huts and all the latest scientific gear for conquering the snowy wastes.

At the same time, Roald Amundsen, a Norwegian, was getting set for the same dash. But he followed Peary's example, taking only the simplest equipment—dog teams, skis and sleds.

A year later the tragic story of the race between these two men was told. Scott, with four companions, dogged by misfortune and appalling weather, and dragging their own sledges, reached the Pole to find the Norwegian flag flying above an empty tent. Amundsen, with eight companions on skis, their sledges drawn by dogs, had beaten him by a month. With heavy hearts, the Englishmen turned for their base—800



Department of Defense photo

During the Byrd expedition to the Antarctic, the submarine *Sennet* had to be rescued by Coast Guard. Below, Roy Chapman Andrews made the headlines when he discovered these dinosaur eggs in Gobi Desert





Department of Defense photos

Airborne magnetometer is used by explorers for mapping terrain under polar ice fields. It was used by Byrd in Antarctic



Portable generators provided valuable electricity for explorers in Little America. Below, trimetragon cameras installed in PBM-5 provided aerial photos for perfect map of Antarctic



miles of solid dragging on foot in the face of a screaming blizzard. They never made it. Eight months later their bodies were found frozen in a tent nine miles from a supply cache. Beside Scott's body lay his diary telling the whole poignant story and ending with the heroic words: "It seems a pity, but I do not think I can write more."

With World War I came enormous strides in the field of aviation. Three pioneer flyers in particular saw the key that the airplane would provide to the mysteries of the world—Sir Hubert Wilkins, Admiral Byrd and Lincoln Ellsworth. As early as 1897 an attempt had been made by a Swede, Dr. S. A. Andree, to fly to the North Pole in a balloon steered by sails and guide ropes, but this ended in tragedy. Empty message buoys from the craft were picked up years later—but no sign of the balloon was ever found.

But in April 1926, the *Chantier*, a relic of the World War I wooden Liberty ship fleet, steamed out of New York harbor. Stowed in her hold was a Fokker monoplane, the *Josephine Ford*, and aboard were Admiral Byrd, then a Commander, and his navigator Floyd Bennett. At King's Bay, Spitsbergen, the plane was put ashore. Just after midnight on May 9, 1926, the two flyers took off and headed north in perfect weather. Fifteen and a half hours later they were back in Spitsbergen—the first men in history to fly over the North Pole.

A few days later another American, Lincoln Ellsworth, with the Norwegian, Captain Amundsen of South Pole fame, took off from Spitsbergen in an airship, the *Norge*. Whereas Byrd on his flight returned to Spitsbergen after reaching the Pole, Amundsen and Ellsworth kept straight on and, after 72 hours in the air, sighted the coast of Alaska and landed at Teller near Bering Strait.

Byrd's No. 1 moment of glory was still to come. Immediately after the North Pole flight, he confided to Amundsen that his next ambition was to fly over the South Pole. On Jan. 1, 1929, a base was chosen on the Bay of Whales and christened Little America. A radio station was soon set up and elaborate equipment, including five planes, husky dogs, a snowmobile

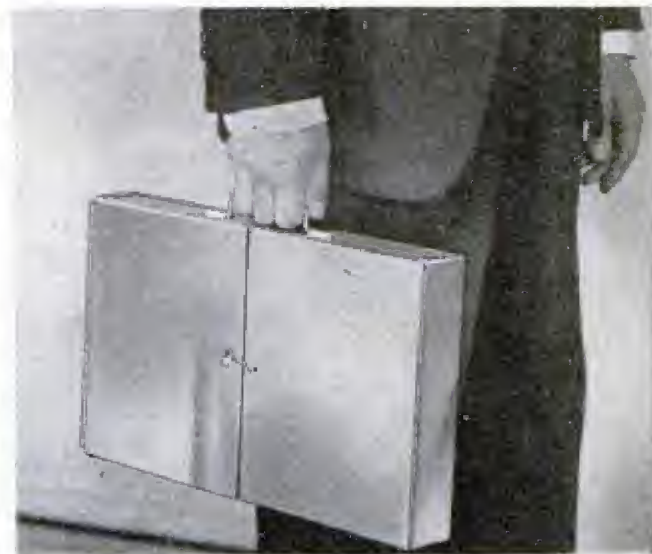
and large stores of food and clothing, were landed on the Antarctic icecap. After reconnoitering up the Liv Glacier Canyon, Byrd's dream came true. He made the first flight over the Pole—on Nov. 28, 1929. At the controls of the three-engine Ford monoplane was a modern Viking, Bernt Balchen.

In some ways the most unusual polar attempt was the undersea voyage of Sir Hubert Wilkins. An aviator of worldwide experience and a veteran explorer, Wilkins wanted to reach the North Pole under the ice in the submarine *Nautilus*. He failed largely because the sub was an old one and inadequate for the job. I once asked Wilkins the reason for abandoning his novel attempt. His reply: "The captain's teeth!" Knowing from experience that intense cold always brings on savage toothache, Wilkins insisted that all his men see their dentists. Only one man failed, and when they submerged beneath the icy waters of the Arctic Ocean the captain of the *Nautilus* was in such agony that they were forced to turn back before reaching their goal.

Some of the greatest boons ever provided to explorers have come out of World War II, especially in aviation and in the way of clothing and food. Last summer I took time off from my radio work for a journey to the subarctic with the Juneau Ice Field Research Project, sponsored by the American Geographical Society in Alaska. There I participated in some unusual flights from a vast glacier. These were made by C-47s—spectacular jet-assisted take-offs from the neve surface and over the crevasses of a 750-square-mile ice field. Planes dropped supplies by parachute to us on the icecap. One of the chief purposes of the expedition was the study of glaciers. Leader Maynard Malcolm Miller and his colleagues gouged out cores of glacial ice with an oil rig from several hundred feet down! These ice cores are fabulous. They're like translucent glass and hard as rock. This big expedition, which hopes to continue its work for 50 years, is trying to find out how fast the glaciers are receding. All of which has much to tell us about the changes in the world's climate and the gradual warming up of the earth. Without modern exploration methods, such discoveries would remain locked forever from man's knowledge.

If you think mechanization is spoiling the high adventure of exploration, you're wrong. There is nothing dull about the tale that came out of the Alaskan wilderness of four Bureau of Reclamation geologists exploring for power-dam sites in the territory's wild canyons. They were finally rescued by helicopter after a series of incredible experiences. Daryl Roberts, Ade Jaskar, Terrence Robbins, Harry Johnson

(Continued to page 252)



Brief-Case Picnic Grill

Light, sturdy and so compact that it folds into a small package resembling a brief case, a charcoal-and-wood grill is designed especially for picnickers. Meat may be grilled on one of two lower levels while other food is cooked on top. A charcoal pan situated in the base of the unit is easily removed after the fuel is burned. Weighing only nine pounds, the unit has over two square feet of cooking space.

Ice-Cube Airports

Drifting on the Arctic Ocean are three massive islands of ice, the cause of both chilling alarm and interesting speculation by our military strategists. These three ice-cube islands probably have been circling the Pole for thousands of years. Unlike polar pack ice, they are relatively smooth, and already are level enough to serve as landing fields for military aircraft. One of them is 20 miles long, 20 miles wide and 200 feet thick. To whom do these unsinkable carriers belong? How can they be used? Can they help solve the mysteries that still swirl about the polar region? You'll find some strange answers in a feature in the September issue of *Popular Mechanics*.



Huge Pile-Up Occurs in Stock-Car Race

Stock-car race fans at Oakland, Calif., got more than they expected when 11 cars piled up in the first lap of a race. A photographer shot the accident as it happened. In the photograph, one car is rolling over, an-

other has completely reversed its course, a third is climbing the embankment and the others are mixed together like the ingredients of a tossed salad. No one was injured in the remarkable crash.

Italian Fiat

Featuring a special body built by the Ghia factory of Turin, the Italian Fiat 1400 has the same unbroken lines as the newest American cars. Its four-cylinder engine has a displacement of 1395 cubic centimeters (85.09 cubic inches), about twice that of the smallest American car. A one-piece curved windshield and completely recessed door handles are incorporated in the new body.



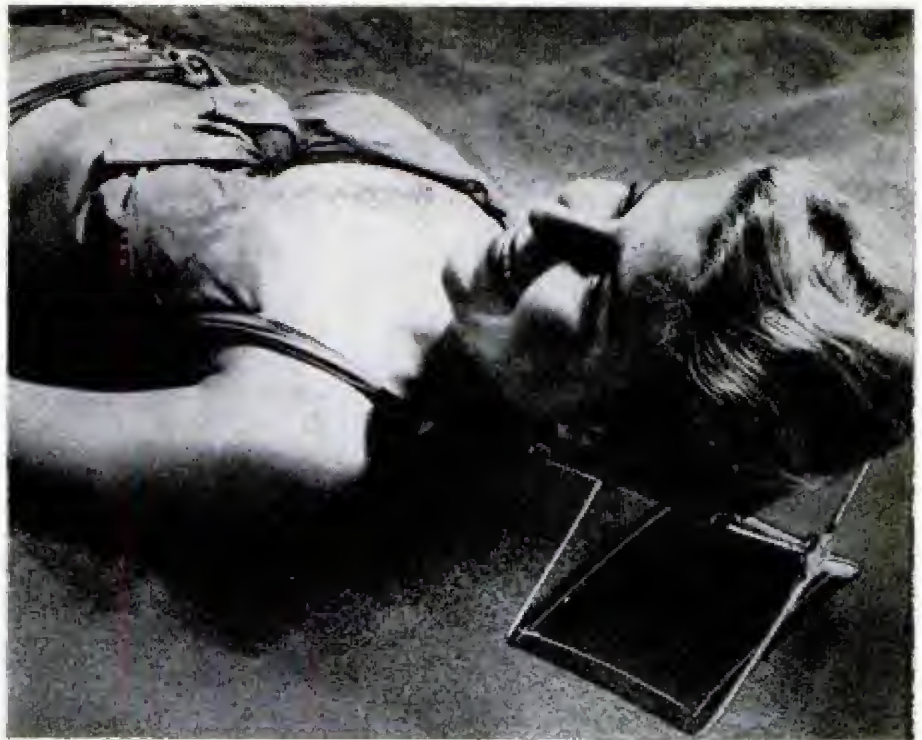
Car Cooling-System Cleaner Has Thermostatic Shutoff

Automobile engines and radiators are flushed and cleaned safely by a clamp-on device that operates with no outside connections except to a water supply. A thermostatic control automatically shuts off the engine if the temperature rises above 190 degrees, thus preventing engine damage from overheating. A special chemical is placed in the mixing chamber atop the radiator and is fed into the system as the engine operates.

☐ From 1900 to 1951, the U. S. automotive industry produced 116,413,562 motor vehicles, according to the Automotive Manufacturers Association.

Head Hammock

Sand is kept out of sunbathers' hair by a simple but effective cradle for the head. Made of canvas and two wire frames which open and collapse like the hinges of a scissors, the open ends of its frame are connected by strips of canvas. The lower piece acts as a strut to prevent further expansion of the frame. The upper strip is a miniature hammock which serves to keep the head elevated inches above the ground. Air circulates freely around the back of the head and neck.



Italian Speedster

Touring Europe's racing circuit this year is a Mercedes Model 300 SL that features an aluminum body 50 inches high. Its 2996-cubic-centimeter engine develops 170 horsepower. Three carburetors feed gasoline into the engine, which has an 8 to 1 compression ratio. Doors are cut into the top and extend down only to the lower edge of the windows. Hinged at the top, they pivot upward.

Spiked Disk Aerates Soil

Operated like a lawn mower, a spiked disk cuts thin slots in the lawn to aerate the soil. The tool can be weighted with a heavy rock. As it moves across the lawn the spikes loosen the earth and enable water to sink into the turf instead of running off. If the aerator is used before re-seeding or top dressing, the seed and fertilizer settle into the perforations and can't be washed away. Use of the aerator does not alter the appearance of the lawn, as the turf hides the thin slots.

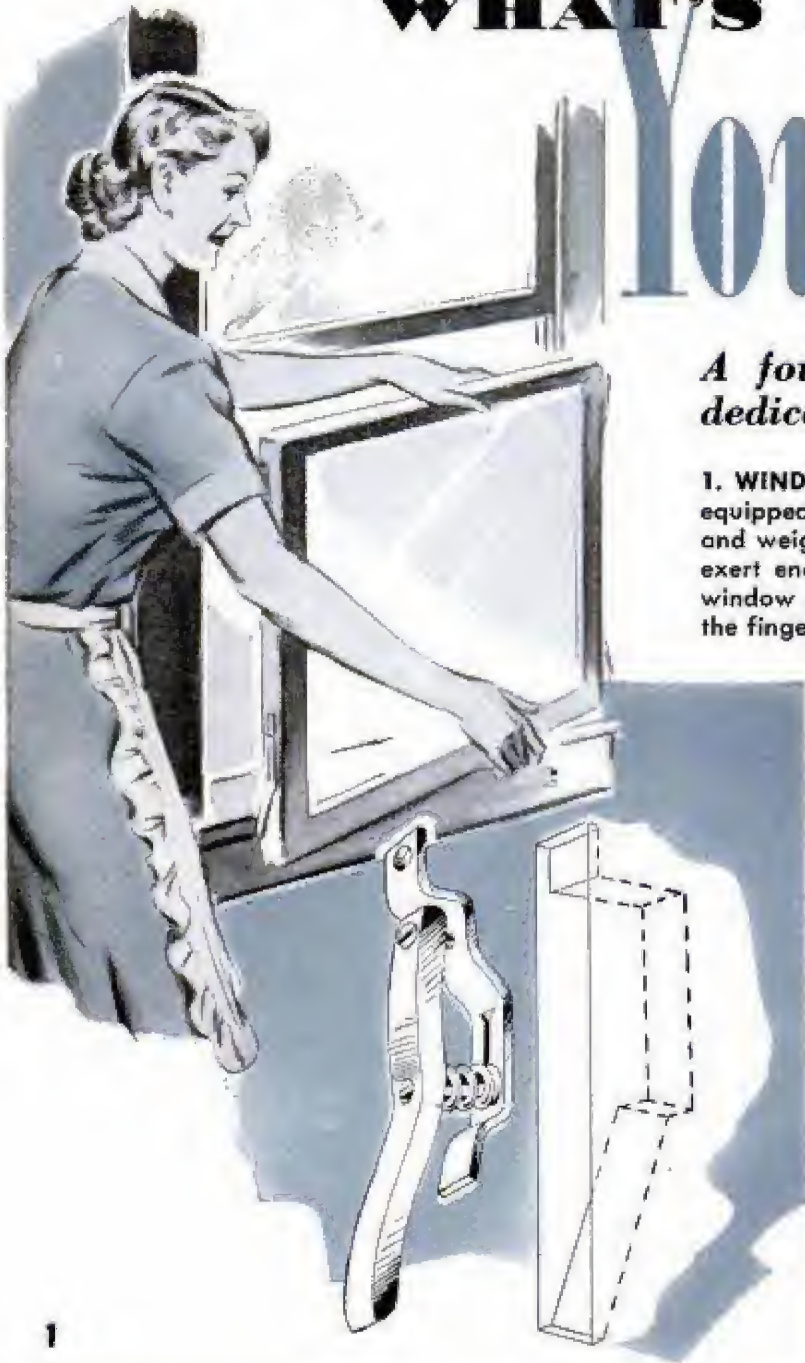


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WHAT'S NEW FOR Your Home

A four-page "shopping section" dedicated to modern homemakers

1. WINDOWS lift out for washing or painting when equipped with a balancer that eliminates sash cords and weights. Two spring-loaded fingers on each sash exert enough pressure against the jamb to hold the window up. Sash is removed by forcing it against the fingers to compress springs and free opposite stile



2. **FURNACE HEAT** is turned down at bedtime, back up in the morning by a timer unit that hangs below the thermostat. You set it to the hours you want. At night, heat from a coil on top of the unit fools the thermostat by raising thermometer reading 10 degrees above room temperature. In the morning, the coil turns off automatically and furnace comes on

3. **SHELF** that hooks over the rail of a window sash is wide enough to support planters, bric-a-brac or other items. The shelf, made of plastic, comes in a variety of colors. Supporting the shelf are a pair of metal strips that slip into the opening between the sashes. Two projecting lugs provide additional support against the inner surface of the lower sash

4. **SHUFFLER** handles up to four decks of playing cards at one time, riffling them automatically when the crank is spun a few times. You simply put one half of the cards on one side, half on the other side and turn the handle to complete the shuffle. The device is made of plastic and is four inches high, eleven inches long. It operates noiselessly

5. **JACKET** for a clay flowerpot, below, dresses it up in colorful style. Cut to form tapered cylinders that fit snugly around standard sizes of flowerpots, the Vinylite plastic covers come in various colors and designs. Snap fasteners hold them securely in place. The durable plastic sheeting is not stained by water or chemicals and wipes clean with a sponge

6. **CLEANING TOOL** has a wide variety of uses. It has two foam-rubber pads that clean both sides of Venetian-blind slats at once but that is not all. The two halves of the cleaner separate so you can use them individually. One has a rubber squeegee to wipe windows dry after the pads have cleaned them. The pads and squeegee can be replaced when worn

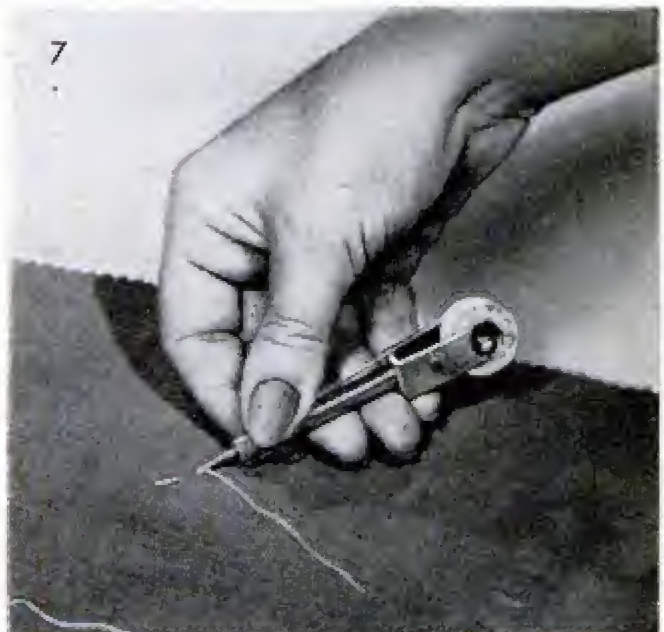
7. **TACK MAKER** carries its own supply of thread to speed the task of tacking material to a pattern. It has a curved needle so the tacks can be sewed in without lifting the material or pattern. A built-in cutter snips the thread which is wound on a round sewing-machine bobbin that holds enough thread to make 400 tacks without the needle being rethreaded



6



5



7

WHAT'S NEW FOR Your Home

Continued from preceding page



8



9

8. **FRUIT CUTTER**, above, is so simple it's hard to believe! You merely place it over the fruit and press down on the two handles. It cores the apple or pear and cuts it into 15 perfect wedges in one motion. It also does a fine job of slicing French fries, too

9. **RAZOR BLADES** whisk off whiskers when honed on a sharpener with four abrasive surfaces. Blades are placed over two pegs which rotate as the case is slid back and forth along a string, moving the blade in a circular motion over the honing surfaces

10. **SOCK DRIERS** adjust to all sizes between 10½ and 13 in men's socks. The toe of the frame is made of Tenite plastic tubing which is moved forward or back by means of a notched indicator rod that shows sizes. They're available in women's sock sizes also



10

11. **SHARPENER** provides the housewife with a quick way of eliminating dullness from kitchen knives. It is a wooden stick containing an abrasive hone and has blocks at each end to prevent accidents and to guide the knife blade at the proper sharpening angle



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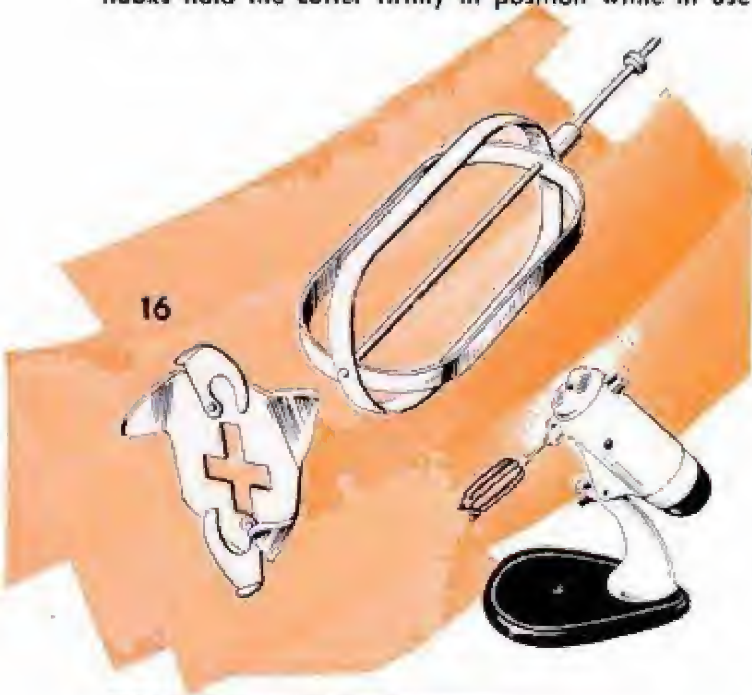
12. NONSLIP CLAMP lightens the chore of putting up storm windows or screens. You don't have to carry them upstairs — you merely clamp the device on the frames and pull them up. A sliding lock prevents the clamp from opening and also provides a quick release

13. EGG COOKER makes a "soft boiled" egg that is shell-less. Actually, it isn't boiled. You break the egg into a cup, put on the lid and slip the cup into the metal holder. Lower it into a pan of water kept just below boiling. The egg is served in the cup, too

14. ZIPPERS are repaired at home in a few minutes with a foolproof metal tool that has no moving parts. It opens and closes the teeth efficiently so you can replace jammed or broken sliders. You don't have to remove the Zipper from the garment to make repairs

15. INSECTICIDE dispenser shoots out a fine spray of dust when the molded rubber cap is squeezed. The cap is designed to fit on a standard package of the insecticidal powder and is reusable. Concentration of dust is controlled by the amount of pressure used

16. BLENDER attaches to the bottom of a beater element on an electric mixer and chops up fruits, meats or vegetables. It purees foods, too. Three cutting edges chop the food into small bits quickly. Two small hooks hold the cutter firmly in position while in use





Weyerhaeuser Timber Co. photo

Saws Fight Fires

When flames break out near logging operations on a Springfield, Ore., tree farm, ordinary power saws are quickly converted to portable fire fighters. Small but effective fire-engine pumps are brought up, saw bars are removed from saw motors and fire pumps attached in a matter of seconds. Soon water drawn from near-by ponds and streams is combatting the blaze. If the fire is in a hard-to-reach section, the 97-pound seven-horsepower units and the smaller five-horsepower motor-pumps are easily carried there.

Easily Portable "Tepee" Serves as Sun-and-Wind Shelter

With a collapsible "tepee" you can carry your sun-and-wind screen right with you. The little shelter is designed for beach and sports use. It consists of three six-foot poles covered with waterproof material. Rolled up for storage or transportation, the shelter measures less than five inches in diameter and weighs only six pounds. Two of the shelters can be pitched together to form a complete tent or one can be used as an open shelter.



Golf Accessories Holder

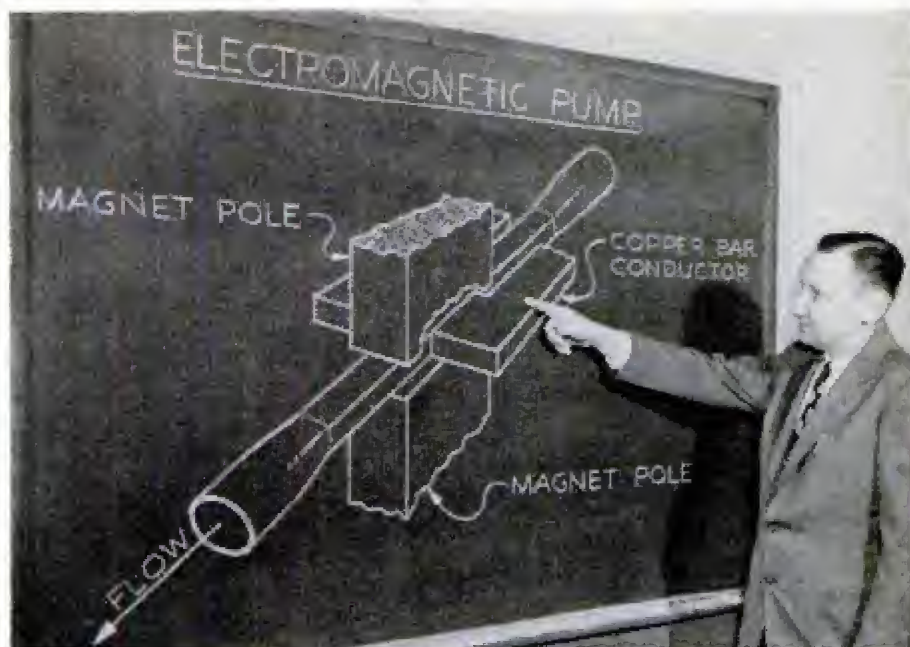
Easily attached to the handle of a golf-bag cart, a new accessories holder accommodates a score pad, tees, pencils and cigarettes. There is a special slot for lighted cigarettes and a clip which holds an extra golf ball. A solid writing surface is provided for use in marking scores.

Stoplight Halts Only Fast Drivers

Motorists in Virginia are protected by a new stoplight in use at a dangerous curve near Natural Bridge. Normally red, the light's time interval is designed to make drivers halt if they are traveling too fast to go around the curve safely. A car approaching the curve passes over a detector in the highway which sends an impulse to the stoplight. If the car is moving 25 miles an hour or less, the light turns green before the motorist has to stop. Those traveling faster must stop until the "go" signal is flashed.

Electric Currents Pump Hot Metal

Large quantities of liquid metal are pumped through a tube by a simple electromagnetic instrument developed at Argonne National Laboratory. The new pump is being used to move a metal coolant through the experimental breeder-reactor at the Atomic Energy Commission's testing station in Idaho. It is a length of stainless-steel tubing that has two copper bars soldered on opposite sides. This assembly is placed between the poles of an electromagnet. The tubing is connected with inlet and outlet pipes. The current passes through the liq-



uid metal, developing in it a longitudinal thrust. The pump will move liquid metals at a temperature of 750 degrees F.

Windowless Water Meter Is Read by Use of Magnetic Fields

Completely sealed water meters with no glass windows or dials to leak dirt and moisture are read magnetically. The man who reads the meters carries a cylindrical device about the size of a teacup which has the conventional meter dials built into it. He places the device on top of the meter head. Magnetic fields set up inside the meter spin the dials on the reading device

to show how much water has been used. The meter can be read underwater and there is no possibility of leakage. Any water meter can be adapted to the reading system by substituting a magnetic head for the standard dial-equipped head. The inventor, J. Mack Hood of Corpus Christi, Tex., says it takes only three minutes to convert any water meter to his system.



Belt Clip Carries Golf Balls

Golfers who dislike carrying loose tees and balls in their pockets can slip them into a plastic holder that fastens to the belt or waistband. The little kit has built-in space for two golf balls, a tee and a pencil for scoring. The items are gripped securely in their pockets, yet snap easily in and out of place.

Science Sees "Life" Molecules

For the first time scientists have seen the giant chemical molecules that apparently are of tremendous importance in affecting heredity and the changing of one disease into another. Scientists of the National Cancer Institute have announced that, through the electron microscope, they have seen a single nucleic-acid molecule. This type of molecule is found in the heart of living matter, particularly in the chromosomes and genes of all cells that pass on the stream of life. The molecules also are major constituents of viruses and have the strange property of changing one type of bacteria into another.

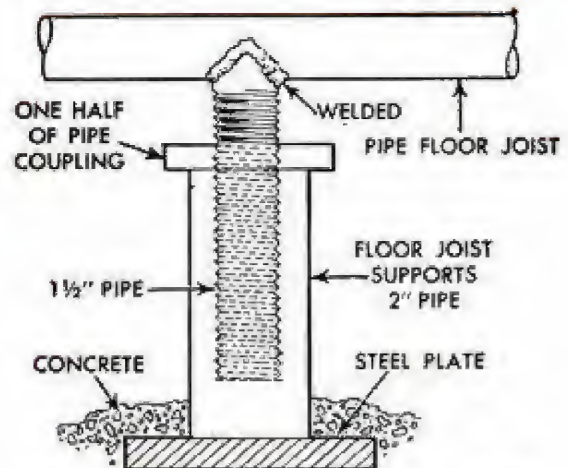
Tools That Make Tools

... that make everything else. Next month an Anniversary feature takes a long look at that grandsire of all industries, the fashioning of machine tools. It's the story of a single tool with 99 cutting edges, the tale of a man who lost two fortunes trying to shave away a tenth of a thousandth inch, the account of one tool four stories high. Above all, it's the story of the most precise craftsmen on earth. Don't miss this exciting feature in the September issue.

HOUSE OF



John F. Wagner of Johnstown, Pa., designer and builder of "pipe dream" house, uses steel pipes as both structural members and part of heating system



TURNING THE COUPLING RAISES AND LOWERS HOUSE TO REMEDY SETTLING



Wagner is covering the outside of his house with brick. The Celotex beneath the brick is fastened to the pipe framework. He estimates the cost at \$5000

Below, skeleton of the pipework is shown before any covering went on the house. The Celotex was attached to the framework by iron studs brazed to the pipe



PIPE

A JOHNSTOWN, PA., pipe fitter is making his "pipe dream" of an ideal home come true.

John F. Wagner is building his house around a framework of pipe. The home will be constructed so that not only will the pipes serve as an integral part of the house, they also will be used as a heating and cooling system.

Wagner plans eventually to put pipes into the ground for removing the heat of the earth to heat his home in what he terms reverse-cycle refrigeration. And he figures the house will only cost \$5000!

The Johnstown man purchased a lot in Armagh, Indiana County, to put his pipe dream into reality. When completed, the house will be fireproof, termiteproof and rodentproof. In addition, it will be many times stronger than a house built of wood. Each of the 1¼-inch pipes used in the framework is able to stand a 6500-pound strain.

"Still another advantage will be my home's ability to withstand an atom-bomb blast to a far greater extent than the ordinary type of home," Wagner pointed out. "Built of brick and metal, the house will stand tremendous pressure."

Wagner has fastened Celotex to the outside of the pipe framework by means of iron studs brazed to the pipe. Inside, wire lath will be wired to the pipe uprights and covered with plaster.

The floor, consisting of concrete with heating pipes embedded, will be finished with tile or linoleum.

Wagner declared he will be able to raise or lower the home's interior temperature by 20 degrees with a valve system. By circulating cold water through a condenser from a well located next to the foundation of the building, the enterprising pipe fitter believes he will be able to chill the liquid within the framework to cool the house.

For the present, the heating system will consist of an oil-fired boiler coupled with a circulating pump to push hot water through pipes in the walls, floors and ceilings.

Wagner hopes one day to mass-produce his pipe-dream house. ★ ★ ★



Pencil Contains Rubber Stamp

Compactly fitted inside the barrel of an automatic pencil, a rubber stamp and pad provide you with a convenient means of printing your name and address. The inking pad is so designed that when the pencil is closed the rubber die presses against it and always is ready to use. Despite its smallness, the stamp can be made with as many as three lines of type.



Scooter-Style Bicycle

Pedal crank, chain and rear wheel of a new-type bicycle are encased in metal to keep the rider from getting dirty. There is a small tool compartment behind and above the front wheel. The scooter-style cycle was developed in Berlin's west sector.

□ Since 1940, the number of electric-trolley coaches in use in the United States has increased 132 percent.



Electric Mower

Weighing only 12 pounds, a new electric mower cuts grass up to six inches tall and has a capacity of 3000 square feet per hour under normal lawn conditions. The motor



is built into a cylindrical housing behind the blades. The mower cuts a 14-inch swath and will operate with as much as 300 feet of cord. Its light weight makes it convenient to use around shrubbery and flower beds.

Wheels for Garden Rake

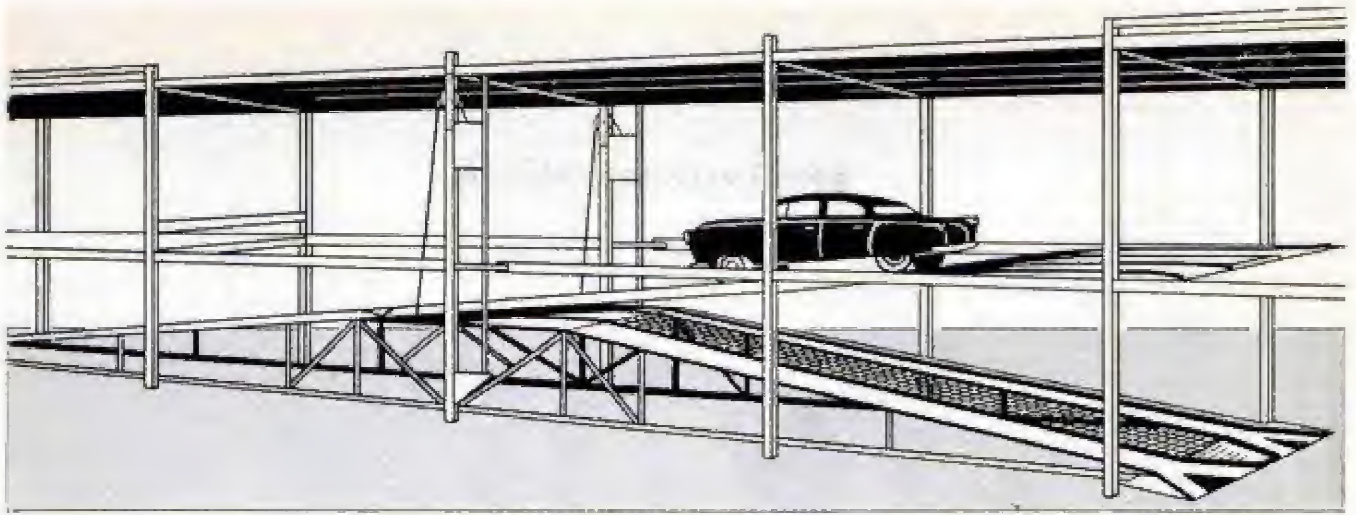
Small plastic wheels which fit onto the end prongs of an ordinary garden rake keep the raking level constant. The adjustable rollers permit the rake to travel along at a regulated depth so that objectionable growth or debris is combed out and desired growth is left standing. Because sufficient pressure can be applied, a definite cultivation level is maintained. The rake does not dig in or jump over parts of the terrain. A clamping device permits the rollers to be adjusted up or down and then locked at the desired raking depth.



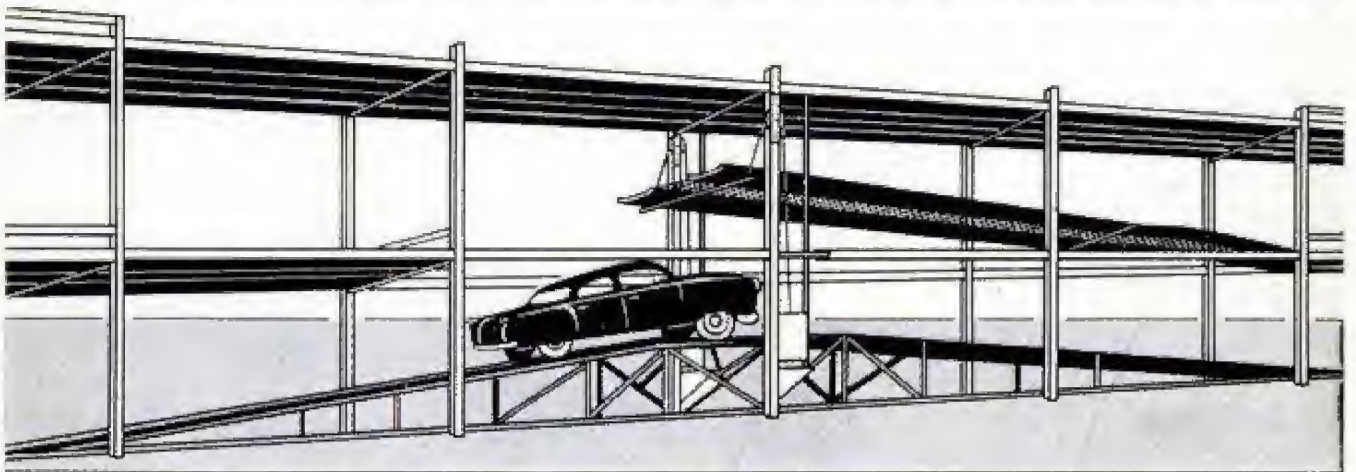
Bellows Duster

Bellows provide air pressure for a handy plant duster. Easily and quickly filled, the lightweight unit holds up to eight pounds of powder. Adjustment is possible to provide a uniform flow from a fine fog of spray to a heavy cloud. Extension pipes permit spraying in hard-to-reach places. The sprayer weighs only five pounds when empty.

Watermelons only eight inches in diameter—compact enough to fit easily into the average refrigerator—have been developed by scientists at the University of California.



Ramp positioned, above, for interfloor travel and, below, raised for cars moving between sections on same level



MULTIDECK PARKING LOT

PARKED CARS are delivered to owners within three minutes, even during peak rush hours, at a new three-level parking lot in Beverly Hills, Calif. Attendants ride a vertical hoist to reach cars on the upper floors.

The upper half of each ramp is hoisted up out of the way by an electric motor when an attendant needs to use the ramp as a driveway to move a car from one side of the building to the other. All ramps can be converted for "up" operation during an incoming rush, then changed to "down" position for quick delivery of cars. The attendants use slide poles to return to street level after parking a car.

The patented multideck structure has 412 large individual stalls, each with steel guide curbs to protect the cars. The structure is fabricated from assemblies of four basic shapes, weighs 600 tons and can be assembled in 600 man-hours. Costs are said to amount to half or less of a comparable steel-and-concrete parking building. The three-level building parks

four times as many cars as can be parked on the surface alone and the structure can be disassembled and moved to another site at low cost if the need arises.

The individual car stalls at the Beverly Hills lot are 8 feet, 4 inches wide and average 17 feet, 9 inches in length. A 2-foot-wide walk between each stall separates the parking spaces.

Steel curb guides protect cars as they travel on ramps. Sets of rollers spin under the wheels and slide them into position



All-concrete home of Arthur C. Avril has floors of new concrete that's easy on feet and can be waxed like wood

By George Laycock

From a laboratory at the University of Cincinnati comes word of a new . . .



CONCRETE THAT



Nails can be driven into the "wonder concrete" only an inch from edge of slab without cracking surface. They can be pulled out the same as from wood. Below, Robert Howe, who developed the concrete, tests the strength of bond between it and a piece of wood



This concrete has many of the same qualities as wood. Here it is being sanded like a wood floor



MEN HAVE MADE concrete for so many centuries that anything new in concrete comes as a surprise. Into the building scene now comes a concrete development with an exciting scientific story behind it. It is the story of a concrete that may revolutionize the plans for homes you and thousands of others hope to build.

This concrete came from a laboratory on the campus of the University of Cincinnati. It was developed through the skill of a youthful civil-engineering instructor with a yen for research.

Bob Howe, the scientist who concocted this new building material, had a big job. The job was dreamed up in the beginning by Arthur C. Avril, the energetic president of Sakrete, Inc., a firm manufacturing ready-mixed concrete. Avril was in the process of building a home. Because he admittedly is partial to concrete, he wanted the entire house made of it.

When it came to building the floor, Avril ran into trouble. He wanted to use radiant



Photos by George Laycock

PROMISES MIRACLES

heating. But ordinary concrete is hard on feet and rugs would cut down the heating efficiency. "What we need," said Avril, "is a special concrete for this job."

He took his problem to the University of Cincinnati. Bob Howe went into his laboratory with a collection of standard-sized concrete forms, a group of complicated measuring machines and an open mind.

Six months later he produced a concrete that met all of Avril's specifications. The concrete, which is now being groomed for its commercial debut, has most of the good properties of wood used for flooring. It can be sanded, stained, painted, polished, waxed and in general decorated to fit any room. A floor made of it is waxed about once every two years. It makes a beautiful floor that need not be covered with rugs and it is easy on the feet for it is almost as resilient as wood.

If the need arises, the homeowner even can drive nails into this concrete without chipping it, then pull them out leaving no larger hole than would be left in wood.

In addition to being a good material to work with, the concrete Bob Howe invented is inexpensive and has at least twice the tensile strength of ordinary concrete. It also contains an ingredient with which it can be bonded to wood, metal or other concrete. This makes it especially valuable for use in laying new floors over old ones.

Most concrete floors are poured at least two inches thick to keep them from cracking. But not this one. It won't crack though poured only $\frac{3}{8}$ inch thick. Avril says the concrete will furnish flooring at far below the cost of hardwood.

What are the possibilities for the future of such a concrete? They seem unlimited. In home building it can bring several advantages, especially radiant heating, with-

in reach of thousands of middle-class home builders. And it should be a boon to industry where large floor areas and rising costs demand a strong, durable flooring material at reasonable cost.

One large Hollywood studio is interested in resurfacing all of its studio floors with the concrete. "Wood floors," the movie executives say, "cost too much to maintain."

The concrete had its first real test in Avril's recently completed home on the outskirts of Cincinnati. The entire floor of this rambling, single-story, nine-room home is a layer of the new concrete poured over a layer of ordinary concrete in which the heating pipes are embedded. The Avrils have home-tested it for every quality they ordered. They've stained it different colors to match the rooms. They've lived on it and found it comfortable on the feet. The heat, with separate controls for each room, comes up through the floors for constant comfort.

Floors made of anything but concrete in this house would be out of place—the whole house is concrete. The walls are of concrete poured in place between forms held by columns made of concrete. The roof, also poured in place, is supported by pre-poured concrete beams. The concrete roof is covered with a layer of slag for added insulation and beauty.

Avril, who plans to turn his search for a better floor into a major industrial enterprise, is not telling just what it is in his concrete that makes it different. But he believes that Bob Howe mixed a concrete with a future. Home builders who have seen the concrete in use and have studied its properties and advantages agree with him. They're admitting that after centuries of concrete construction (the Romans used it) there is now a new concrete that promises miracles. ★ ★ ★



CAN A HOT ROD go 300 miles an hour?

Amateur speedsters will find out this month at the national speed trials on Bonneville Salt Flat, Utah. One thing is certain—last year's mark of 230 miles an hour will go by the boards.

At least four unlimited-class streamliners will vie for top speed honors. Each of them represents a year of part-time work by its owners, usually two or three young men who pool talent and cash to compete for the hot-rod "Oscar."

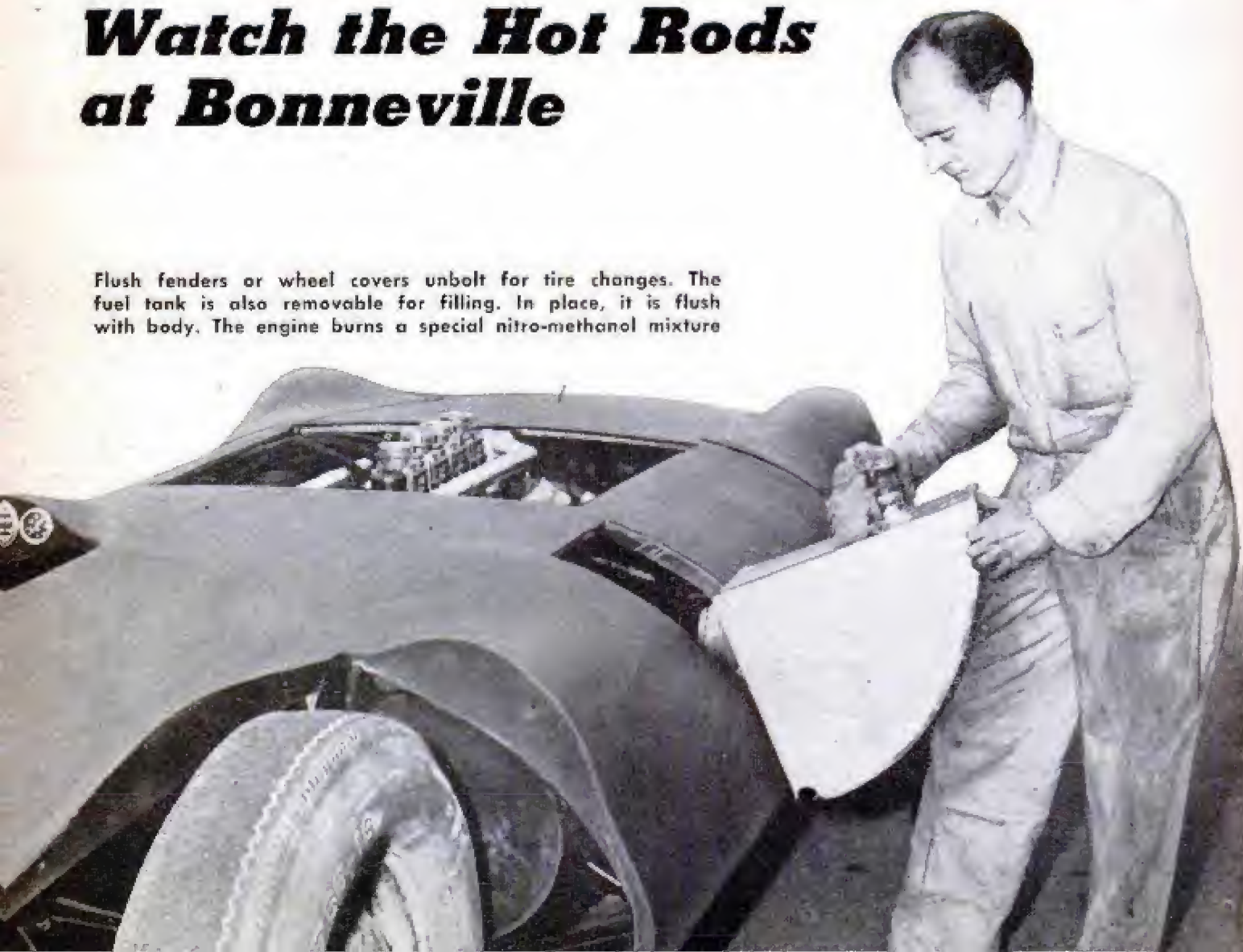
The ultra streamliner shown here may be this year's champ. Its owners and builders, Harold Post and Doug Hartelt, both of Orange, Calif., predict it will do better than 275 miles an hour. ★ ★ ★

Sleek as a porpoise, the Post-Hartelt hot rod is 20 feet long. Plastic bubble will protect driver's head during speed trials

***FIVE* miles a minute?**

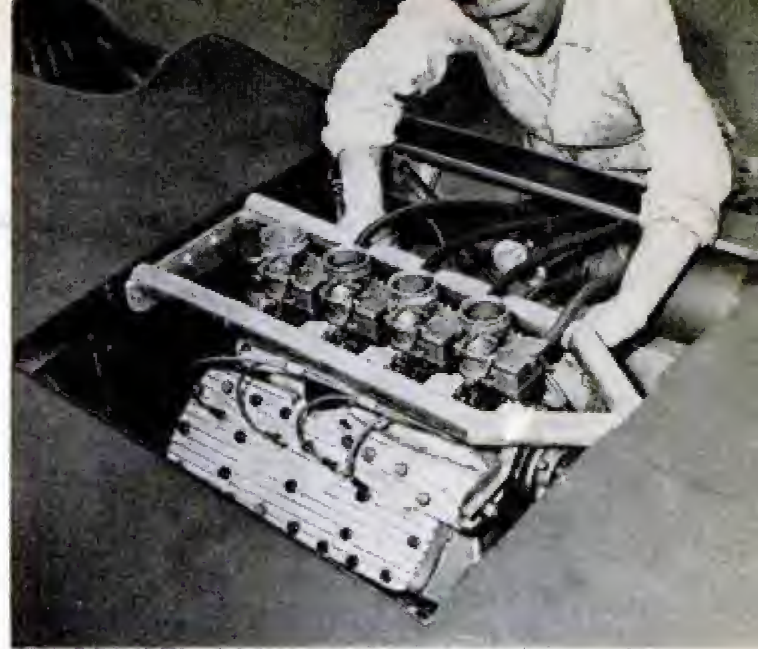
Watch the Hot Rods at Bonneville

Flush fenders or wheel covers unbolt for tire changes. The fuel tank is also removable for filling. In place, it is flush with body. The engine burns a special nitro-methanol mixture





Instruments are few on the tiny dashboard. At 275 miles an hour, the driver can't be looking at dials



Full-race Mercury engine is used in some trials, but in unlimited competition, a Chrysler V-8 replaces it



Side view of the Post-Hartelt hot rod displays its extreme streamlining. "Patch" on side is fuel tank

Below, polio victim Chet Herbert holds model of two-engine streamliner he plans to enter at Bonneville





Tied down during ground tests, the huge XH-17 dwarfs near-by workers. During earlier experiments it broke loose from its moorings and was slightly damaged



Air from compressors run by two turbojet engines is lifted up through the rotor shaft, above, and out to the rotor-blade tips. Fuel is burned at the exhaust outlets, providing a jet effect that turns the blades



Giant Jet Helicopter Ready for First Flight

Initial flight tests are near for the world's largest helicopter, the jet-powered XH-17. An estimated 120 feet in rotor-blade span and 30 feet high, it was built for the U. S. Air Force at Howard Hughes' Culver City, Calif., aircraft plant. The huge "flying crane" straddles its cargo like a lumber lift, picking up loads by attachments to its landing gear and fuselage. It is designed for short-range movement of heavy military equipment, including artillery, tanks, bridge sections and trucks. During ground tests the cargo space has been filled with water ballast tanks. Power from two modified General Electric turbojet engines spins a pair of air compressors inside the fuselage. The compressed air is lifted up through the rotor shaft and out to exhaust tips on the trailing edges of the two rotor blades, almost at their outboard ends. Fuel is burned at this point, in much the same way that an afterburner operates, and flames stream from the whirling blades. Single, projectile-shaped extensions from the leading edge of each blade act as counterbalances. The 40,000-pound craft has two steerable nose wheels and two sets of dual landing wheels. A small airfoil at the tail serves as an elevator.

Geiger-Tube Altimeter

Geiger tubes may help future pilots know their height more accurately at extreme altitudes. It is estimated that the new altimeter won't be more than 1000 feet off at 30 miles above the ground. Conventional aneroid-type altimeters are unreliable at very high altitudes because there air-pressure changes are small for corresponding changes in height.

Right, latest model of the Wagner twin-engine plane has only one tail and fuselage. Below, close-up shows how one propeller shaft is extended slightly so the blades can overlap. Experts said this wouldn't work out



“SIAMESE TWIN” LIGHT PLANE

WHEN Harold Wagner of Portland, Ore., wanted a two-engine plane, he got it the hard way—by hooking two Piper Cubs together under one wing! He tossed aside the advice of experts and mounted the two fuselages so close together that the propellers overlap. One prop is set about two inches in front of the other by means of

a short spacer shaft. The experts said such a design would cause dangerous turbulence but Wagner has not found it so. He already has designed another “Siamese twin” plane, this one having only one fuselage and tail. It, too, has the overlapping propellers and will carry four persons at 160 miles an hour. It has a 2000-feet-per-minute rate of climb.

Two used airplanes joined together under one wing gave the Oregon pilot the twin-engine plane he wanted





Fish can be controlled electrically. They are made to swim in circles, left, or attracted to one side, right

Fish "Magnet" Guides Fingerlings Downstream

Salmon fingerlings can be guided safely downstream by electricity, biologists of the U. S. Fish and Wildlife Service believe. These scientists have discovered that the fish are, in effect, little magnets. The head of the fish is negative and the tail positive. By setting up underwater electrical impulses of positive polarity, the scientists can attract the baby fish away from dangerous areas such as spillways and turbines. Cer-

tain electric waves can be used to stun fish and by current changes the stunning can be selective—male salmon reportedly being stunned while the female remain unharmed. With this knowledge, the scientists hope to cut down the number of fingerling salmon that are killed on their way to the ocean. Current estimates are that about 95 percent never reach the ocean because they are killed in power penstocks.



Mechanical Egg Salesman

You can buy eggs any time of the day or night at an automatic egg store based on the coin-operated vending principle. The egg machine was built for Kenneth Downing, a farmer at Los Gatos, Calif. When the proper amount of coins is placed in the machine, an open door exposes a carton of eggs. The customer has a choice of two grades of eggs. When the price per dozen requires pennies, the machine charges to the nickel and change is included in the carton.

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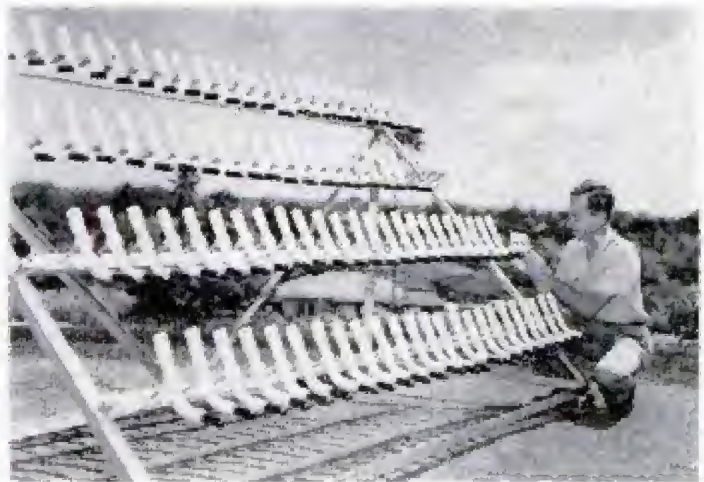
Sugar cane is raised in weather-controlled glass houses to determine the effect of temperature on its growth

Weather Watchers in Hawaii

HAWAII'S WEATHER, supposedly ideal, is under investigation as a result of vagrant tricks. The research is sponsored by the sugar industry, which produces a crop that accounts for about half the territory's export income. The weather in Hawaii plays tricks; for example, one section of

Honolulu has had 120 inches more rainfall in one year than another section only a few miles away. Scientists, with the help of some unique instruments, hope to determine the weather pattern so they can predict cycles, rainfall, humidity, wind direction and velocity, and sunshine duration.

Left, worker measures cane grown under varying conditions. Right, photochemical instruments gauge sunlight



↓ Complicated recording instrument constantly determines the relationship between the sunlight and wind



FIVE SPEAKERS BEHIND SCREEN

SOUND-CONTROL ENGINEER

ROCKET

LASK

PICTURE-CONTROL ENGINEER

AS BOATS LEAVE SCREEN, SOUND FADES AWAY THROUGH THIS SPEAKER

PROJECTOR

EXTRA SPEAKERS FOR OFF-SCREEN NOISES

PROJECTOR

PROJECTOR

MAGNETIC SOUND RECORDER

SOUND FROM SIX MICROPHONES, RECORDED ON ONE TAPE

THREE SEPARATE FILMS

SIX MICROPHONES PICK UP SOUND AS BOATS MOVE

CAMERA TAKES THREE PICTURES SIMULTANEOUSLY

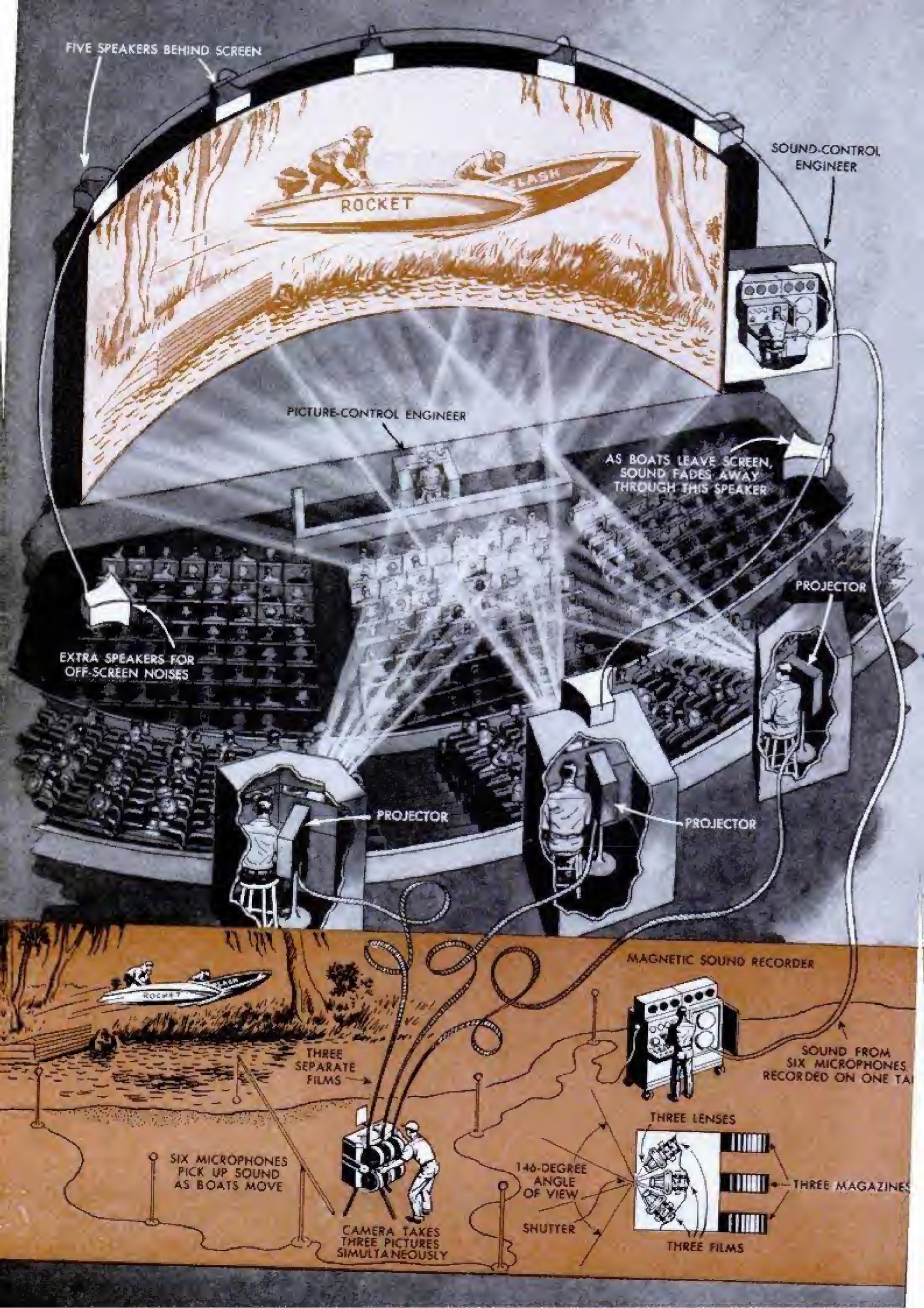
146-DEGREE ANGLE OF VIEW

SHUTTER

THREE LENSES

THREE MAGAZINES

THREE FILMS





Cinerama camera, foreground, photographs flying boats at famed Cypress Gardens with startling realism

Movies on a Curved Screen Wrap You in Action

By Richard F. Dempewolff

IMAGINE WALKING into a movie theater and suddenly finding yourself in the middle of a startlingly real battlefield. Guns roar on all sides. Tanks thunder along ahead of you. On each side of you, soldiers creep through mud. A machine gun crackles behind you. In the corner of your eye you catch a glimpse of action and turn to see a hand-to-hand encounter so close to your left side you'd swear you could reach

out your hands and touch the combatants.

That's the experience some movie-goers will have this fall. The biggest revolution in motion pictures since the advent of sound will emerge from a laboratory on Long Island, N. Y., where it has been under development for several years. Already two theaters—one in New York, another in London—are equipped for public showings. Equipment for two more is all set for installation. Production films are ready to start rolling. Its developers hope that eventually it will become the movie makers' answer to

♦ These drawings tell the full Cinerama story, from shooting scenes on location to the theater showing



Cypress Gardens photo

To increase the realism, the crew cut a canoe in half and mounted the big camera on a water-level platform

TV. And what an answer it promises to be!

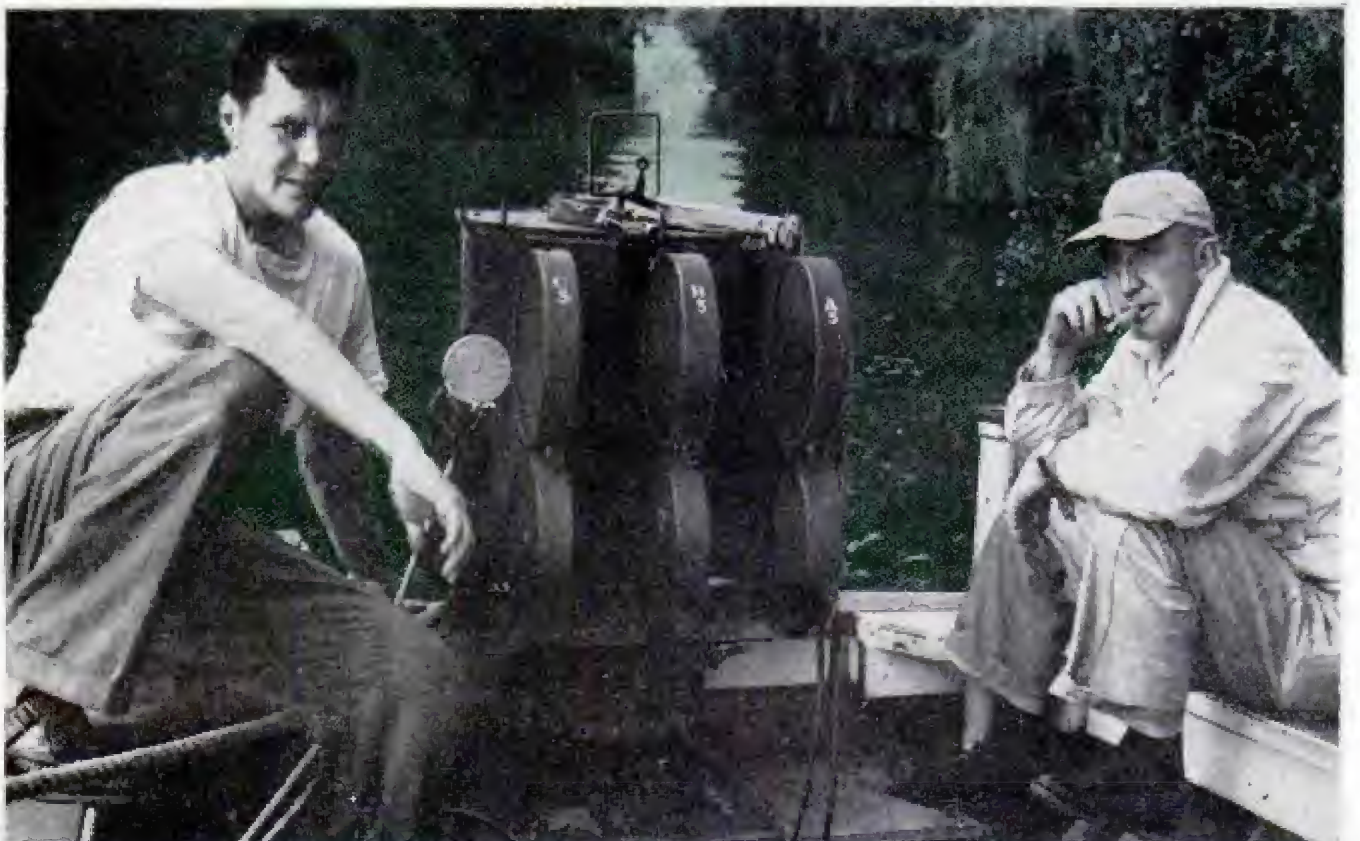
The new movies, called Cinerama, are not stereoscopic. They don't have to be. The huge curved screen, more than three times as wide and half again as high as the standard theater screen, wraps the viewer in the center of the scene. The picture, projected from three booths, encompasses everything a normal person would see with his own eyes if he were standing where the camera was. Result—a three-dimensional illusion created by the viewer's own visual clues. And no one needs to wear the glasses that

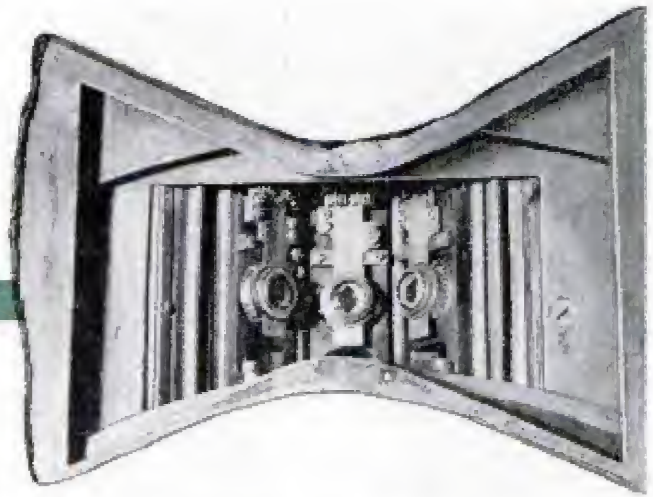
are needed for true stereoscopic projection.

To heighten realism, the Reeves Soundcraft Corp., owner of Cinerama, has added stereophonic, or "three dimensional," sound. If a person on the left side of the screen is talking, that's where the voice comes from. A gunshot on the right comes from that side. An airplane approaching from behind the audience roars overhead and its sound follows it as the image reaches the screen and zooms off toward the horizon far in the background.

So real does the picture seem that you're

Rear view of the camera shows the unusual arrangement of reels made necessary by the use of three films





Three lenses look out through the hourglass-shaped slot in the camera front. Each lens covers about a third of the 146-degree angle of "vision." A single shutter is used. It rotates in front of the lenses at the point where their lines of view cross. Thick layers of absorbent material muffle noise from motor chamber

not in a Cinerama show more than a few minutes before you react physically. You are in a boat at Cypress Gardens, Fla., surrounded by tropical flowers and swamp jungle. A wisp of Spanish moss dangles in front of you, so you reach out to swat it aside. You lean sideways to right yourself as the boat tips when someone else steps into it. You duck so you won't smack your head as it carries you under a footbridge.

Across the lake at the boat jumps, racy outboards roar up from behind you, zoom up ramps, fly into the air right in front of you and plunge into the lake again. You duck to avoid the spray that showers toward you. The boats speed off to the left

Stereophonic recording unit puts the sounds from six individual microphones on a six-track magnetic tape



of the screen and the sound follows them.

Cinerama is the result of 15 years of research and the expenditure of millions of dollars. Its inventor, Fred Waller, is a mechanical and photographic wizard. He's the father of the first photographic printer and timer, which, incidentally, is still being used. He created a still camera to take a 360-degree picture and a remote-recording wind-direction-and-velocity indicator.

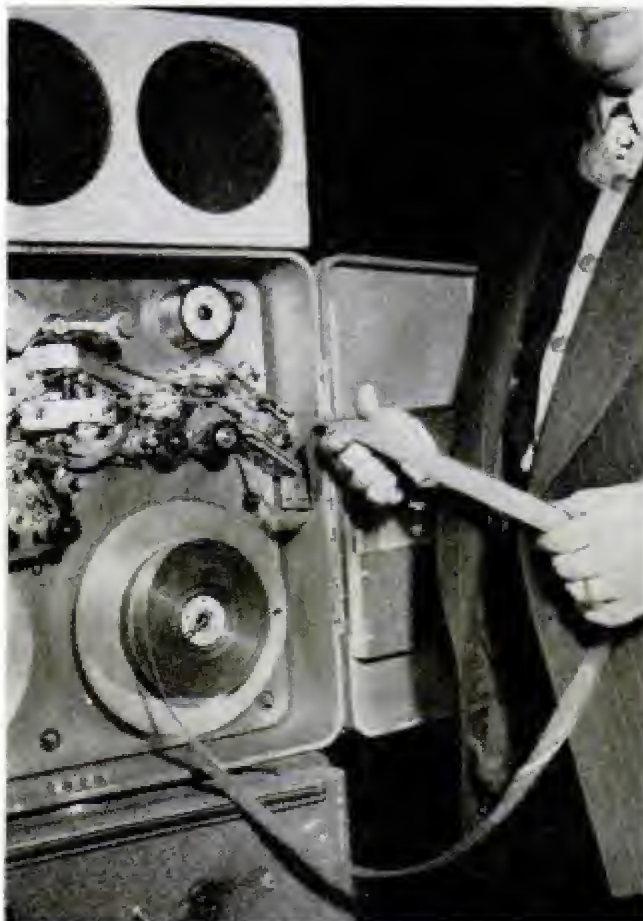
Most famous of Waller's inventions is an aerial-gunnery trainer used by the Navy in World War II. In it, the trainee sat beneath a domelike hood, or sky screen, on which five synchronized projectors threw movies of enemy planes that dove on the

During projection, a picture-control engineer keeps the three films synchronized by watching three disks





When viewed by the audience, the 1100 overlapping strips of the Cinerama screen look solid, but from an angle you can actually see through it. Below, the sounds are recorded by six tracks on a single tape



gunner every which way. The trainer was a step along the road to Cinerama but the theory behind it dates back to Waller's early days in his father's commercial-photography shop in New York City. "Even then," he says, "I had a hunch that three-dimensional photography was possible without stereoptic gadgets."

Later, as head of Paramount's trick-film department, Waller began to use wide-angle lenses for special effects. "I noticed that they produced a faint three-dimensional effect," he says, "and figured it was a clue." He began to study sight in people to find out why they saw the things they did. He hung flaps over the peak of a cap and experimented to see how far he could see to each side. It was quite a bit. He walked around with one eye patched to see if he still had vision in depth. He did.

"I learned," he reveals, "that sight depends on experience; the eye lens paints a crude picture on the retina and the brain fills in details that it knows from experience should be there."

Stereovision, Waller explains, is largely fiction. For most persons it exists in an area of only $1\frac{1}{2}$ degrees and for a distance of a mere 20 feet. One-eyed people, of course, have none. And yet they get what they think is three-dimensional sight. They drive cars and gauge distances as well as anyone. How? "By scores of visual clues that tell their brains what to see," Waller says. "One object overlays another and tells them it's nearer; moving objects increase and decrease in size; angle parallax and a host of other things tip them off to what they should see."

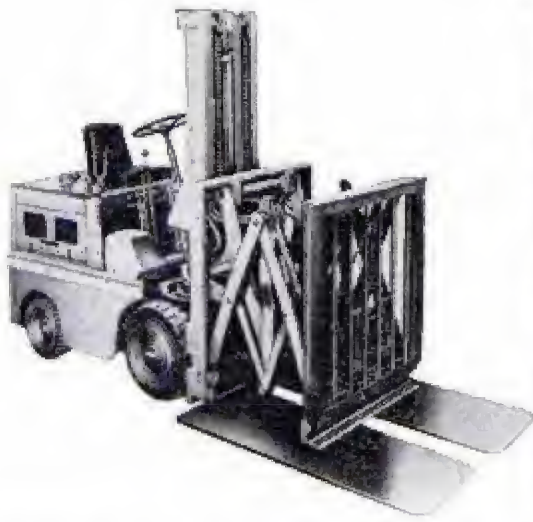
Waller figured that if he could devise cameras and projectors to duplicate peripheral vision (the entire field of a pair of human eyes), the human brain would do the rest since most of the visual clues by which people place themselves and the objects around them in space would be there. Anyone looking at such a picture would feel he was standing in the middle of a real scene. He would be the camera.

The inventor's first attempts to make such a camera looked mighty odd. One had seven lenses. It took a wide picture, all right, but the projected image was distorted on a standard screen.

"Then," says the inventor, "a New York World's Fair exhibitor asked me to make him a projected-picture display inside a sphere, just to be different. He barely mentioned it when I knew I had the answer to my environmental movies. I'd been using flat screens only because I was so accustomed to them. Obviously, a person sees a curved view in real life."

Sure enough, the World's Fair exhibit

(Continued to page 234)



Lift-Truck Attachment Eliminates Pallets

Conventional pallets aren't needed when a new attachment is used on gas or electric lift trucks. Loads are handled on inexpensive cardboard sheets. When the truck approaches the load, a rack moves forward. It works like a pair of tongs—a jaw on the

rack opens and grips one edge of the cardboard sheet; then as the rack retracts, the load is drawn onto the carrying plate. When the load is to be discharged, the rack simply moves forward to shove it off the plate.



U. S. Air Force photo

Homemade Hot-Air Unit Warms Hospital Planes

Korean battle casualties are kept warm during stopovers on their airborne way to U. S. hospitals by a novel homemade heater. An airplane's heating system stops working when its engines are turned off. The mobile unit, designed and built by M/Sgt. J. J. Zaludek and Sgt. William Janton of Andrews Air Force Base, was made largely from scrap. Heat is blown into parked aircraft through an accordion-type canvas duct fitted with a metal shield that is inserted in one of the plane's windows.

Sportsman's Chair Cooks Meals

Although Glenn F. Butler of Detroit, Mich., always enjoyed duck hunting and ice fishing, he suffered from the cold weather. To warm him on his expeditions he developed an aluminum chair with a heating unit beneath the seat. The chair weighs 17 pounds and can be strapped to the sportsman's back. The legs are constructed to serve as runners on the ice. One heating unit warms the chair—and the sitter—in cold weather but Butler adds additional units inside the seat to cook his meals, heat his tent and dry his clothing. The chair is fueled with alcohol. A baffle between the heat source and the surface of the seat toasts his sandwiches while he sits. Soup can be warmed simultaneously in the heating compartment.





Two-Piece Boat

Joined by a hinge amidships on each side, a two-piece plywood rowboat is helping Army Engineers in their flood-control work. Each half is about 10 feet long and can be used alone if necessary. A long pin joins the two sections of hinge. In working over flooded land, the boats often are damaged at the front end. With the two-part boat, the passengers can move into the undamaged stern, unhinge the other and abandon it. The boat is designed for use with a 20-horsepower motor and will accommodate six persons.



Safety-Belt Release To Aid Pilots

Seconds after a pilot and his seat are ejected from an airplane, a new device automatically unfastens his safety belt. A cord attached to the floor is pulled and sets off a small powder charge after five seconds' delay. The exploding powder automatically opens the belt.

Rail Midget and Giant

When General Electric finished two powerful electric freight locomotives for the Pennsylvania Railroad, it rolled out one of its midget engines for comparison. The small locomotive will haul ore far beneath the earth in a mine. A battery supplies it with five horsepower. The new giant engine will barrel along on the surface, its 2500 horsepower pulling a long freight train at 65 miles an hour. In comparison, top speed of the mine locomotive is only four miles an hour.

¶ Converting hypo salts into a chemically different compound that can be rinsed out of paper and emulsion quickly, a new photographic chemical developed by Brown-Forman Industries cuts print-washing time and water consumption as much as 80 percent.



Army Helicopters Flown Across Pacific

When H-19 helicopters were needed in Korea, the Air Force knew how to get them there in a hurry—fly them! But the copters were passengers this time as they were stripped down and packed into a C-124 Globemaster aircraft. The loading was done at Westover Field, Mass.

Mica-Flake Insulation Adapts to Fine Work

Sheets and tapes made of mica flakes are available as thin as .006 inch for electrical insulation. They can be impregnated with resins and bonded to paper, glass or cloth. Resulting from a new General Electric process which generates a force within the flakes that holds them together, a more uniform thickness and the absence of voids give the new product better dielectric strength than present machine and hand-laid mica insulation.



G. E. Develops Lightweight Motor With Aluminum and Nylon

Pound for pound, a new lightweight electric motor will do about twice as much useful work as existing motors of the same type. The new fractional-horsepower motor, developed by General Electric, will power motorized tools, oil burners, office

appliances, farm and dairy equipment, pumps, blowers and other types of equipment. Weight is saved by a reduction in size, by the use of aluminum in structural parts and by more effective ventilation. Nylon is used in the insulation system.

U. S. Marine Corps photo



Two-Piece Bird Startles Soldiers

United Nations infantrymen did a double take when they saw what appeared to be a giant bird soaring through the air with its prey clutched underneath. A second look showed it to be a Marine helicopter carrying the fuselage of another helicopter at the end of a cargo hook. The fuselage was being salvaged from a near-by crash landing in which no one had been injured.

Sources of supply for available products described in this issue are listed in the index, which starts on page 12. Sources of further information on other articles in the magazine are listed in the WHERE-TO-FIND-IT LIST, which is available without charge from the Bureau of Information, *Popular Mechanics Magazine*, 200 E. Ontario St., Chicago 11



Can Hometown, U.S.A., afford its own TV station? For more than two years, Hoosier pioneers have been proving it can. Writing their own rules, they are showing the nation what happens when . . .

TV

COMES TO THE SMALL TOWN

By Norman Sklarewitz

WHEN THE FCC "defrosted" its ban on TV-station licenses, the first question most of us asked was: "Does our town get a station?" The second question was: "If we do get one, can we afford to run it?"

The first question is easy to answer—the FCC has listed the communities that will get channels. It's the second question that's tough—everybody knows that TV stations cost money, plenty of money, to build and operate. But in Bloomington, Ind. (population: 28,163), there are some electronic pioneers who have been breaking a trail for the industry and proving that TV is not a monopoly of the big cities—and proving it at a profit!

These pioneers operate WTTV, the nation's first small-town television station, one that will be a blueprint for prospective station owners the nation over.

If you think it surprising that this small

Monroe County town has a TV station, then get set for a few more jolts. This past winter, the station moved to new studios and boosted its power to 5000 watts—enough to cover almost one third of the entire state. What's more, its 650-foot antenna is perched atop a 707-foot hill. The combined elevation makes this tower higher than the million-dollar rigs on the Empire State Building!

By most TV standards, WTTV is one of the industry's gray-bearded veterans. Its history goes all the way back to the primeval days of 1948. It was then that a successful electronics manufacturer, Sarkes Tarzian, got interested in the potential of local television.

Tarzian was already closely associated with the manufacturing side of the business. In Bloomington and in several other Midwestern cities, he owned small plants



Above, much equipment in the WTTV control room is "homemade." Man in rear is both production manager and local newscaster

Opposite page, the complete studio during a telecast. At left of camera, announcer does a commercial while a hobby program awaits cue at rear. Right, artist makes cards for use in tomorrow's commercials

where tuner units, selenium rectifiers, air trimmers and tubes were made. He himself had invented and perfected the techniques for mass-producing many of these.

This, plus the fact that "Mr. T." already owned WTTT, a 5000-watt radio station in Bloomington, made his curiosity about video natural. Unlike the situation today, when moneyed backers are scrambling for broadcasting channels, Tarzian had no trouble at all getting a spot on the sparsely settled TV band. At the time, in fact, three channels were available in Indianapolis with no takers.

His inquiries about bringing TV to Bloomington, however, were greeted by every reaction from laughing disbelief to dire warnings. Well-backed network stations were losing thousands of dollars a day in New York and Chicago, he was told. Besides, there was no talent in Monroe County. And where do you get TV cameramen and transmitter engineers? Lastly, someone pointed out that there weren't even any sets around.

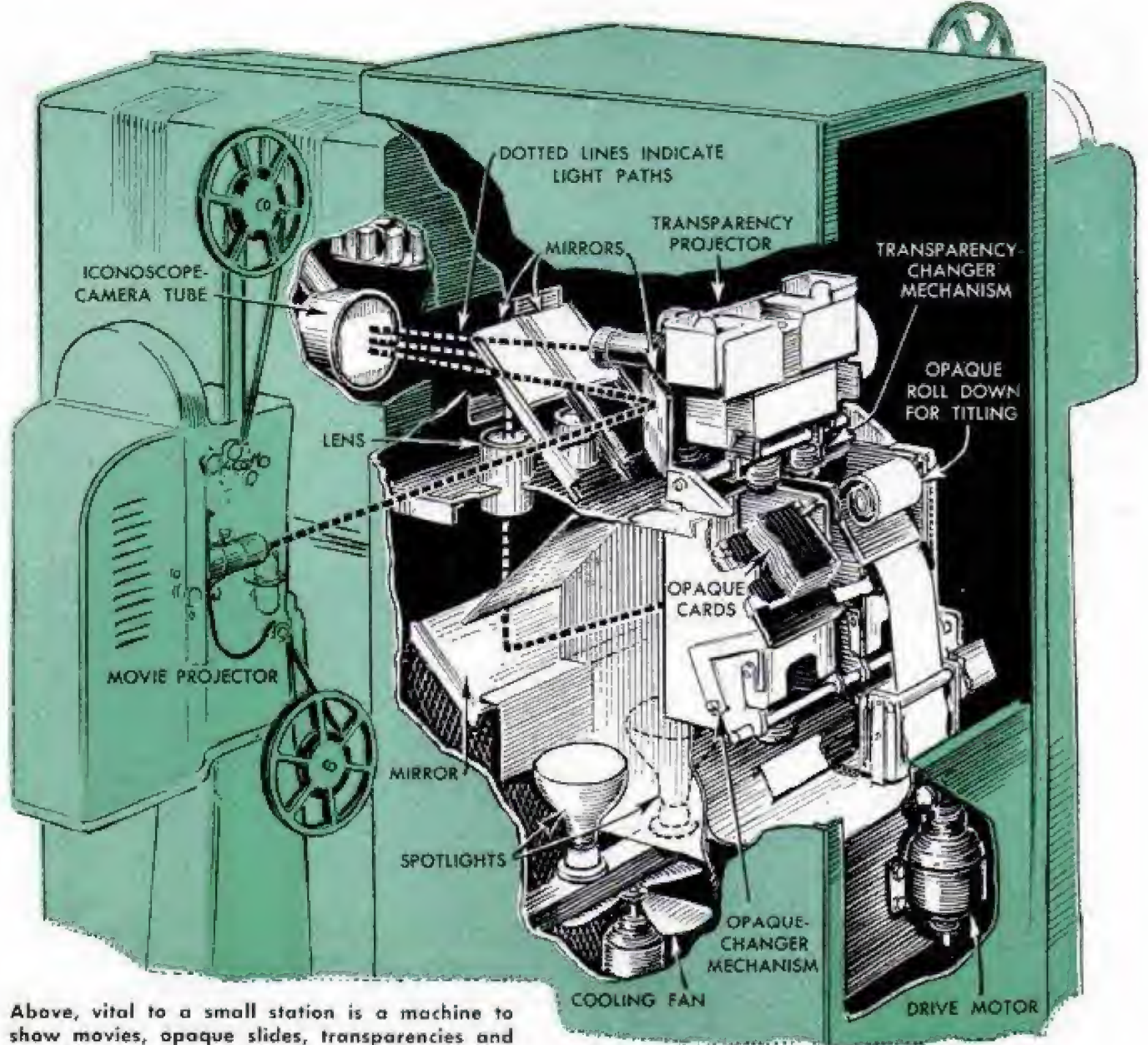
These were indeed sound arguments. But they made little impression on Tarzian. He applied for and got channel 10 on the VHF band. Then he buckled down to make a TV station in Bloomington.

First he called in his plant engineers and outlined his ideas to them. Here were practical-minded technicians. When they said they'd back him up, Tarzian was ready to



Above, microwave station near Pikes Peak, Ind., relays network shows to Bloomington from Cincinnati (see map below). Tower at left is used. Windmill tower at right was original installation. Transmitter is inside block house under "dishpans" at tower base





Above, vital to a small station is a machine to show movies, opaque slides, transparencies and title "roll downs" through one iconoscope. Below, the original homemade pickup camera at WTTV



go. An empty drugstore was rented for studio space and to house the transmitter. Then his crew set out to get the electronic gear together that would put this dream on the air.

They immediately discovered there was no such thing as a commercially made channel-10 transmitter. If they wanted one, there was only one way to get it—build it themselves. The engineers huddled briefly and decided to chance it. Mort Weigel, a young 250-pound Hoosier electronics wizard, took over as chief engineer. Soldering irons burned late into the night during the next few months as the transmitter, video monitors, control panels and the antenna were fashioned.

As the back-shop gear took shape, one of the men dropped in to see Tarzian with a studio-equipment catalog. There was one item that stopped them—studio pickup camera. Price tag: \$15,000!

"How much are the parts for the thing?" asked Tarzian.

The technician checked: About \$4000.

"Then go ahead and have some fun; build one of them, too," said the boss.

That soon became a habit. A fancy overhead-microphone boom costs \$500. With scrap pipe and a little ingenuity, the WTTV gang put one together for \$28.30. Bathroom fluorescent fixtures made fine studio lights. And soundproofing? Well, any similarity between papier-mache hamburger cartons and the wall covering at WTTV is strictly no coincidence.

Time was growing near when the transmitter would be ready. That meant the problems of programming and talent had to be met next. This time the answer came from no farther away than the city limits of Bloomington. Like every small town, it had its share of talented young people—singers, dancers, lads with a yen to be announcers or producers.

Marc Williams, a young Bloomington boy, took over as news director; Charles Haines came from the Indiana University art department to be part-time art director; a local truck driver turned up as Uncle Dale, master of ceremonies for *Happy Valley Folks*, a variety show that later pulled a healthy 1200 cards and letters in one week.

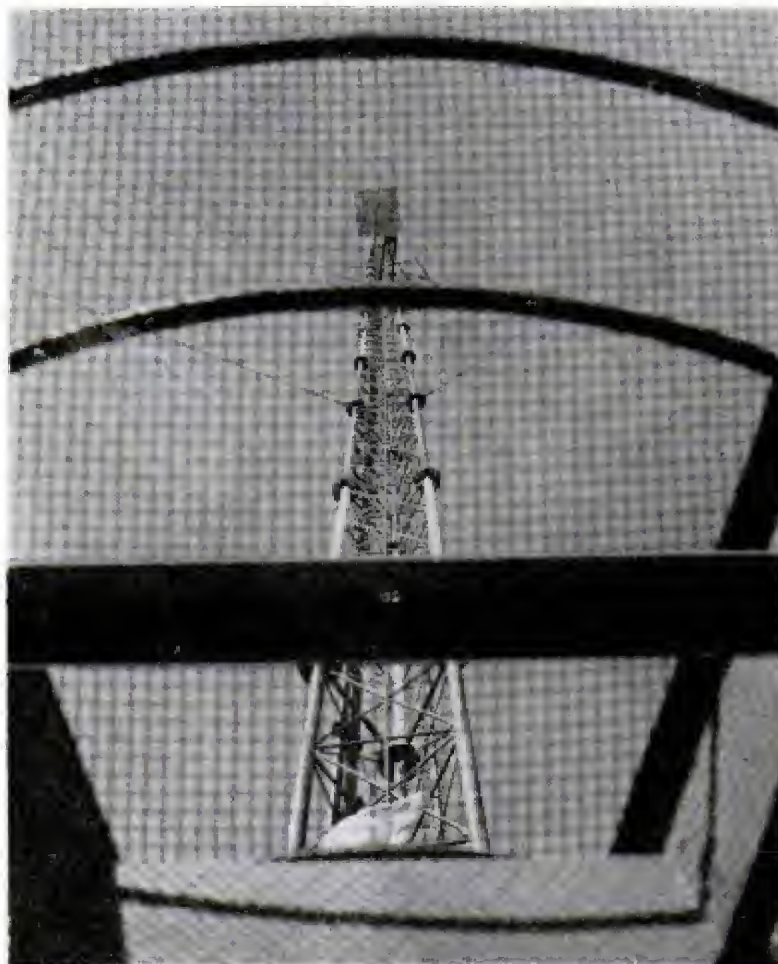
From farms and rural-route addresses

Below, the weekly *Hayloft Frolics* is the biggest WTTV production. It even has a man on the mike boom!



Above, inside one of relay stations. Picture tube at left has been operating 24 hours a day for two years





Looking straight up the 650-foot antenna mast. Pattern is made by mesh of microwave dishpan antenna at mast base. Square object on tower is reflector that sends microwave signal down to dishpan. WTTV's antenna is atop mast far above reflector

Below, original WTTV transmitter was made under direction of station's chief engineer, shown here at lathe in the studio workshop. Today, the station has a new commercial transmitter



came the copy chief and film director, script writers and producers. Farthest import was 26-year-old Bob Petranoff from Indianapolis, who became program manager.

Finally in November 1949, WTTV went on the air, first broadcasting for only a few hours each evening and then rapidly increasing its programming as technical and creative details were worked out. There were, at one time, only 200 TV sets in that listening area of 90,000 people. These were mostly owned by wealthy families who occasionally could pick up the Indianapolis station. Yet Tarzian had created his station for the benefit of the entire community.

So he bought out entire stocks of sets and loaned them to drugstores, bowling alleys, hospitals and clubrooms. It didn't take long for television to win a place in Bloomington. Today there are over 10,500 TV sets among the city's 14,000 families.

About a year after WTTV started broadcasting, Tarzian thought of the advantages of having network shows on WTTV. There was, of course, no chance of getting a coaxial cable. The answer to this problem was a private system of microwave relay towers that brought in programs of all four networks from Cincinnati.

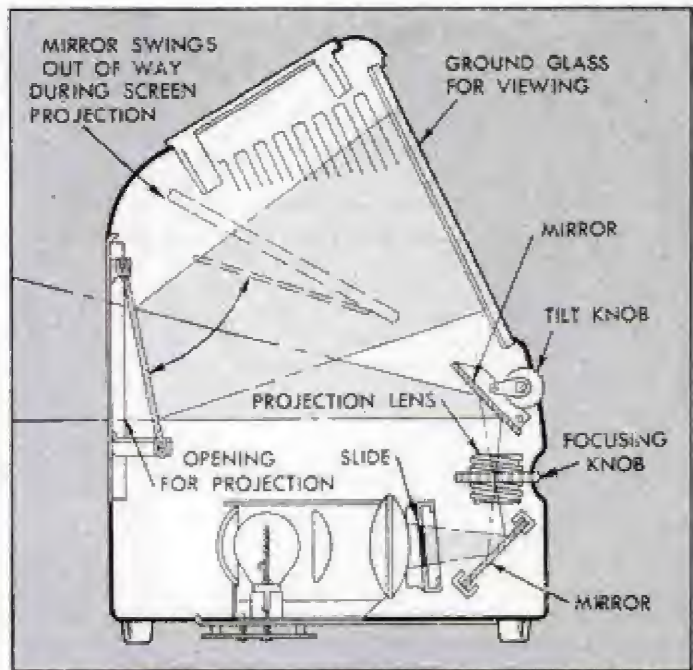
It wasn't too long before the bustling station and its staff outgrew the original drugstore studios. Once more the Tarzian crew made plans for a new installation.

The new WTTV building is one story high and made of concrete brick. It has one main studio, four offices and separate rooms for studio control, film projection and transmitter operations. Despite its simple layout and inexpensive design, the building is an efficient center for all station operations.

Some of the original improvisations in equipment made when the station was first developed are still in use. The same "homemade" studio pickup camera is supplemented by one other commercial camera. But the same video-control equipment and audio-control gear that put the original station on the air are doing equally well now.

Immediately behind the studio building is the transmitter tower. Its antenna puts out a solid signal

(Continued to page 228)



Combination Viewer-Projector Shows Color Slides

Color-slide fans can make one machine do double duty now that a combination viewer-projector has been perfected. The device, designed to take all types of two-by-two-inch slide mounts, throws a clear, bright image on its seven-inch-square view-

ing surface. Simply by changing the position of a mirror in the optical system, you convert the viewer into a projector that fills a 40-inch screen from a distance of only eight feet. It is available in either a convection-cooled or air-cooled model.



Composite Sports Car

Taking parts from 10 different American-made passenger automobiles, Julio Castellano of Tampa, Fla., assembled a sleek sports car. Powered by a highly tuned Mercury engine, the automobile has been clocked at 110 miles per hour. It has an over-all length of 16 feet, is 42 inches high and weighs 2600 pounds. Among 35 entries in an auto show sponsored by the Tampa Sports Car Club, Castellano's hybrid won first place.

Navy Cougar

Top speeds close to 700 miles per hour are expected of the swept-wing Cougar, latest of the Navy's fighting jets. The Navy officially admits it is much faster than the Panther, a straight-wing jet with a top speed of around 650 miles per hour. The new Grumman plane has a ramjet unit hooked to the back end of its Pratt and Whitney turbojet engine which serves as an after burner to supply 40 percent more power on take-off and as much as 100 percent more power at



high speed and altitude. A slotted leading edge on its 33-foot wing permits it to land at speeds that may approximate 120 miles per hour.

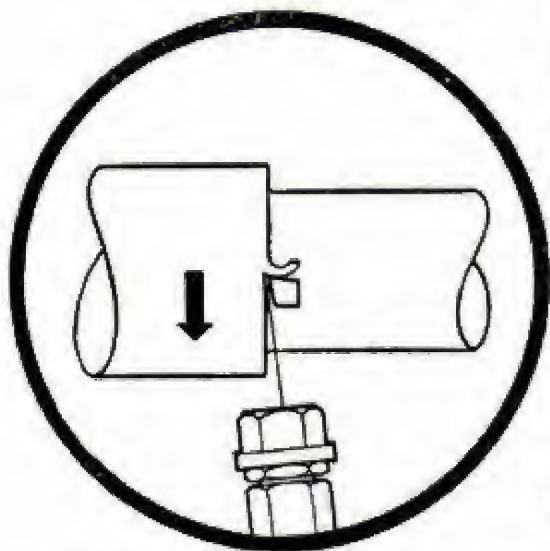
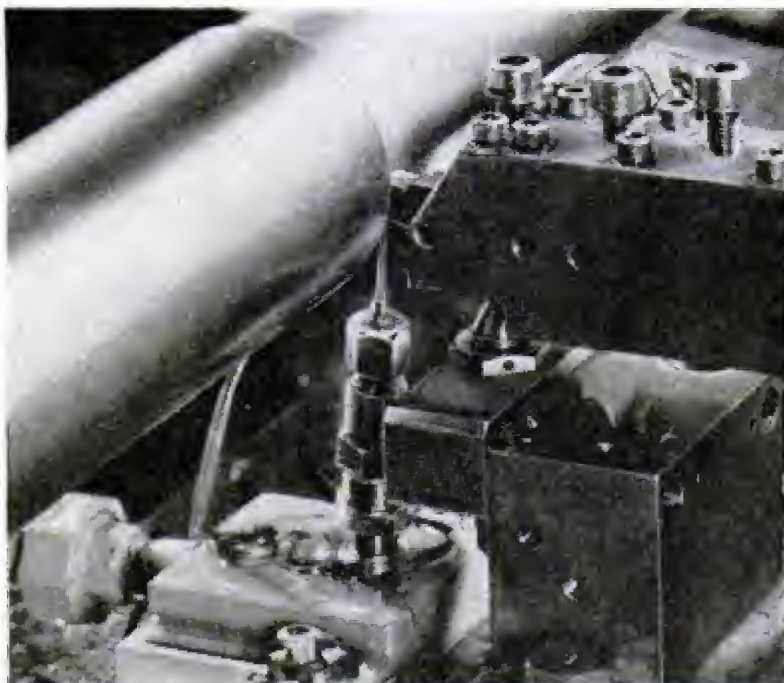


Diagram and photo show how tiny jet of oil is forced between the chip and tool's cutting edge, lubricating the contact point



Upside-Down Oil Jet Improves Metal Cutting

SIMPLY BY changing the direction of a jet of oil, research engineers have developed a new method of lubricating metal-cutting tools. The development may increase the life of the cutting tools 300 to 1200 percent. Developed by the Gulf Oil Corporation, the method uses a high-speed jet of oil directed against the tool from below instead of

Great amount of smoke generated by new method proves that special oil actually reaches edge of tool

above. As the oil strikes the hot edge of the tool it is changed to a vapor which is forced to the actual point of contact between the tool and the work surface. Because more heat is carried away under the new method, more smoke is generated. Shower heads which produce a thin curtain of liquid serve as smoke quenchers.

Smoke is quenched by unique shower head which drops curtain instead of river of liquid around edge





Marine Sergeant Builds Three-Wheeled Roadster

Spare-time effort for four years and \$2000 were expended by Marine Sgt. Roy J. Harris to get a "good, substantial car" embodying his ideas. His creation is a sleek, three-wheeled roadster that does 70 miles an hour with ease and averages about 21 miles to the gallon. Harris, master of five trades, found he needed all of them in building his car. He did all the body styling and metalwork himself, along with the engineering jobs required. The 2600-pound vehicle underwent seven changes in its front-wheel suspension before Harris was satisfied. Powered by a Ford V-8 engine, the

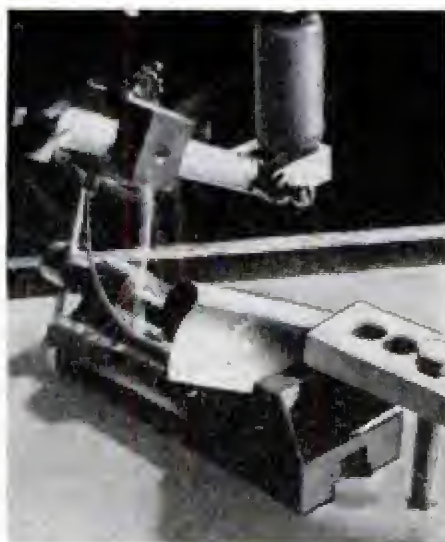
novel automobile has hydraulic brakes, heater, radio and most of the conveniences found in standard models.

Battery-Operated Stethoscope Amplifies Heart Sounds

Heart sounds are amplified greatly by a new battery-operated stethoscope. The device makes audible some sounds that are not heard with conventional instruments. A hand-size plastic housing placed against the body contains an amplifier, two batteries and a switch.

Curved-Hole Drill

Curved holes can now be drilled through steel castings by a hot electric arc. The technique was devised at Westinghouse in order to make possible the recording of internal temperatures at certain places in metals which could not be reached through a single straight hole. The ambling aperture is made by attaching to a standard disintegrating machine a curved, hollow electrode in whose exact radius and shape the hole is to be. A stream of water ejected through the electrode simultaneously with the electric current washes away the molten metal.



☐ In 1950, according to the latest census figures, homeowners exceeded renters for the first time, occupying about 53 percent of all homes.

Chemists Mix a Powder

To Doctor Ailing Soil



Dr. David Mowry, codiscoverer of Krilium, and the wet-sieving machine that tested 5000 combinations of soil and chemicals. Treated soil is put on sieves and sloshed up and down in water to test its stability

Right, the soil conditioner will control erosion on bare slope. It is dissolved in water and sprayed over the soil along with the grass seed. It forms a plastic film on the surface to keep soil in place until the vegetation takes over

By Arthur R. Railton

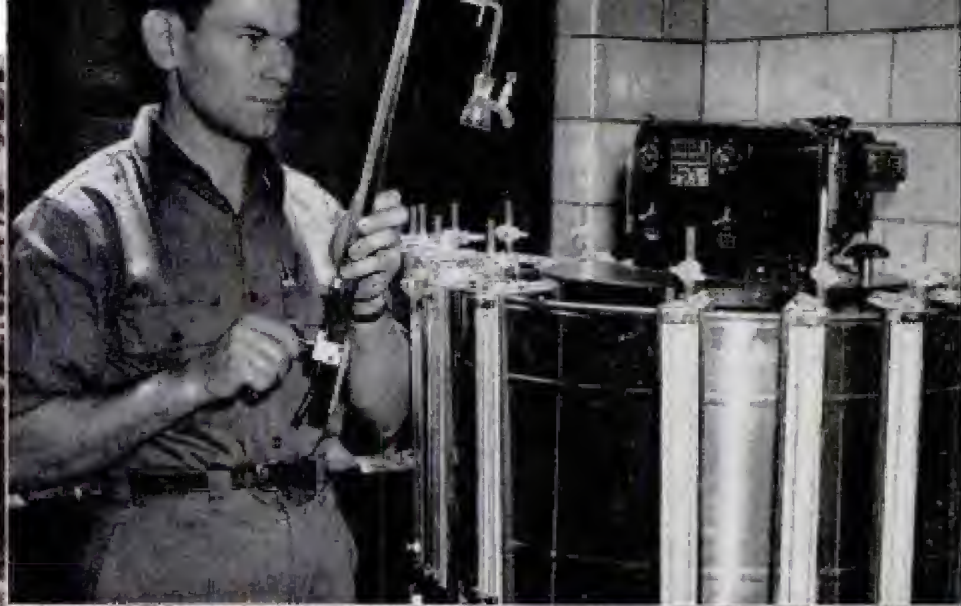
WHAT DID RAIN do to your garden last spring? Did it turn the topsoil into an oozy, slick mud that clung to shoes and fingers? Then did the summer's sun bake that same soil into clods so hard you couldn't tell them from rocks?

If so, and if you've about decided to let the back-yard "ranch" run to weeds next year, don't give up yet—relief is here. You can laugh at such problems now. And your laughter is by courtesy of some scientist "farmers" who do their "farming" in a Day-

ton, Ohio, industrial area that sprouts more smokestacks than cornstalks.

These scientists have ripped a page from nature's recipe book, substituted ingredients here and there to increase effectiveness and come up with a product called Krilium, a soil conditioner. It was the first of several new conditioners introduced to the public this year.

It is the claim of Krilium's makers, the Monsanto Chemical Company, that a pound of this concentrated soil conditioner is more



effective than 200 to 500 pounds of nature's stabilizers, such as peat moss. Whether you're a California truck farmer or a window-box gardener in the Bronx, you're a potential user of Krilium.

It is a sweet-smelling, pinkish powder that could conceivably turn muddy rivers into clear streams, useless clay into fertile fields. It's a synthetic soil stabilizer that possibly could enable man to reverse the washing-away process of erosion and to start replenishing the earth's diminishing layer of topsoil. These are some of the big dreams for Krilium. What it can do for you is no dream though—it can make your gardening simpler, easier and more relaxing and at the same time it may boost yields.

Krilium's base is a modified compound of vinyl acetate (commonly used in safety glass) and maleic acid (an ingredient of paints). Other chemical soil conditioners

Top, Dr. Mel Hedrick, the other codiscoverer of the conditioner, reads scale on a Warburg apparatus used in the research. It provides a controlled miniature garden where effects of soil conditioners are studied

are based on a hydrolyzed polyacrylonitrile.

What the soil conditioner does is prevent the waferlike clay particles from slaking down or laminating under the pounding of raindrops by "welding" them into irregular clumps. An analogy can be made between the soil particles and bricks to explain this action. When bricks are dumped on the ground from a truck, they are arranged in a disorderly pile with hundreds of air spaces between them. Krilium-treated soil particles arrange themselves in the same way. When bricks are stacked up neatly by the bricklayer, they take up less space and have no air spaces between them. Untreated clay particles get like that during a



Untreated

Treated



Untreated



Treated

Flowers show more rapid growth in Krilium-treated soil. These are poinsettia plants at three months

Hard-crusted soil at left hinders the emergence of radish seedlings while loose treated soil does not

pounding rain. When the earth dries, these compacted particles form a hard crust that sheds water like a shingled roof. Plant roots don't get much-needed water. Puny seedlings can't break through the hard crust. Wide cracks appear and through them the lower-level moisture that does exist evaporates more rapidly.

When the soil particles are Krilium-treated, they can't slake down. The chemical forms a bonding agent that makes them cling to each other at haphazard angles,

providing thousands of air spaces for the collection and retention of water. These particles are like thousands of subminiature sponges. The soil becomes crumbly and absorbent. When wet it doesn't stick to your fingers or to gardening tools. You can take a handful of the saturated soil and squeeze clear water out of it! When the soil dries, it remains crumbly. Weeding is effortless—at least as effortless as weeding can be. The weeds pull up easily. Cultivation by hand is no longer a back-breaking

Although costly at present, the conditioner is actually a money saver for such specialized users as nurseries





Untreated

Treated

Treated soil can't pack down as at left because the Krilium "threads" tie particles in irregular lumps

chore because the soil turns over easily.

Tiny seedlings can push through the loose soil instead of having to break through a hard crust. There's increased air circulation around the roots. In test after test, these benefits have meant bigger crops and fewer failures. The scientists are quick to add, however, there's absolutely no fertilizer value to Krilium. You have to feed the crops with nutrients as before.

One of the codiscoverers of Krilium, Dr. Mel Hedrick, said in describing the effects of slaked-down soil, "Seeds planted in such soils don't have a chance. The crust not only acts as a barrier to the circulation of air and water necessary for germination, but if a seedling does appear, it will probably break its neck trying to push through the hard crust."

The second scientist in the two-man team responsible for Krilium, Dr. David Mowry, explains that nature has several soil conditioners of her own. These are gums that produce stable aggregation of particles. Such gums are formed by the decomposition of organic materials such as manures, peat moss, compost and humus. But the gums are minor by-products of the decomposition and are not available in quantities. It takes many tons of organic material to produce one ton of these gums. Furthermore, the gums themselves decompose rapidly and have to be renewed frequently.

Krilium makes the work of shoveling and raking tons of these materials unnecessary. It is 100 to 1000 times more effective per pound for aggregation than the organics and its useful life is much longer—test plots show continued effectiveness after more than three years.

Because Krilium takes much of the backache out of back-yard gardening it will be a boon to the hobby gardener.

There's a word of caution to be added here. Krilium makes crops grow better—

but it makes weeds grow better, too. So don't get the idea that the magic chemical will eliminate all work from your rows of lettuce and radishes.

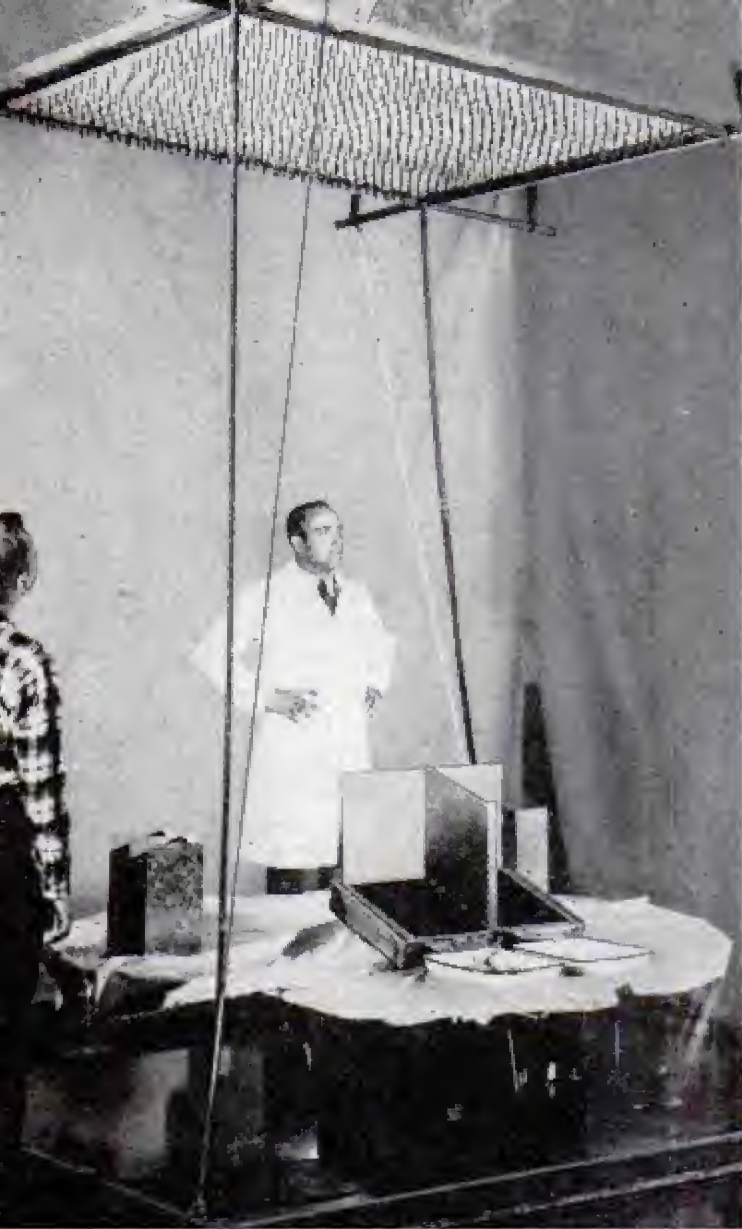
At present, the chemical is not going to appeal much to the farmer with acres of land. It is economically beyond reach because it would cost about \$1000 an acre for the best results. Scientists at Monsanto are studying ways to improve the chemical's effectiveness to cut down its cost. They are also working out cheaper methods of application. Tests are being run on mixing the chemical only in the seed rows instead of over the whole garden. This would provide easy emergence without the expense of full-scale treatment.

But the price is no great obstacle to the back-yard gardener. He can afford to spend \$5 or so to make his garden plot easier to work and more productive. This is not an annual expense—he does it only once and it lasts for a number of years.

Another potential user is the large-scale greenhouse operator, who already has an investment of about \$70,000 to \$200,000 an acre. He has to replace over 50 percent of the soil with natural conditioning materials annually. Both material and labor costs are terrific on such an operation.

Home gardeners will find the chemical excellent for treating the soil in flowerpots and window boxes





Treated soils were tested under this rain-making machine that duplicates nature's rainfall. Below, soil at left was untreated. Notice the runoff and splatter. Soil in right flat was mixed with Krilium



Krilium will do the job cheaper and faster. Then there are farmers who specialize in high-cash crops for canners and quick-freeze plants. They can afford to use the chemical because of the high per-acre return on the land. Other farmers who could increase their profits greatly by getting the crops to market a few weeks early will jump at the chance of using the new soil conditioner. They will be able to work the soil earlier without danger of its freezing up, as it does when worked wet. Krilium-treated soil can be worked when wet because it doesn't compact.

The new chemical may also eliminate much of the crop rotation that is done to improve soil structure.

But the scientists, being the precise persons they are, want it to be made clear that Krilium is no cure-all. It is definitely not a magic material that you sprinkle over the ground and *presto!* you have huge yields without further ado. It won't help your lawn to sprinkle Krilium on top of the sod, for example. Nor will it help to mix it with water and sprinkle it over the grass. The chemical has to be worked into the soil evenly when the soil is dry and to the depth normally reached by the root structure. There's no easy way out.

Krilium also is used to prevent erosion. Mixed with water and grass seed, it is sprayed over steep slopes. The solution forms a plastic coating over the soil which reduces washing away of soil and seed.

In the world of sports, Krilium will make groundkeepers happy. Base paths on baseball diamonds dry out more quickly after rain, smooth over more easily and provide a more dependable surface for bouncing balls. Furthermore, the soil doesn't cling to the cleats of players' shoes.

It may even mean the end of the mudder at the race track! This is probably an exaggeration, but it will make the track surface less soggy during rains and will help it dry out more quickly when the rain stops. Playgrounds, footpaths, barnyards and other areas subject to usage in all kinds of weather will be less muddy when Krilium-treated. Clay tennis courts, if properly treated, can be used almost immediately after a heavy rain.

The scientists who discovered the chemical don't want you to be fooled. Don't expect it to do everything. Remember there are certain soils for which Krilium won't do anything. It works best on clay soils.

It'll make poor soil better and that means more food for the world. Important as that is, Krilium has another merit that will appeal to mothers. As one young mother said after hearing about it: "If it will keep the mud off the kids' shoes this fall, I'll nominate it for a Nobel Peace Prize!" ★ ★ ★



Dual-Tractor Unit Steered by Differential

Using the principle developed for taxiing multiengine aircraft, a New Mexico farmer designed and patented a rig that steers a dual-tractor unit by controlling engine speed. The steering wheel does not turn the wheels at all—it simply increases

and decreases engine speeds in relation to each other. For a left turn, the left-hand tractor throttles down and the right-hand tractor accelerates, thus pivoting the unit around to the left. Swivel-type mountings increase maneuverability.

German Tripod Crane

Handling ships' cargoes at the port of Bremen, Germany, is a strange crane mounted on three stiltlike legs. The crane moves along three tracks on the pier. Its tripod construction allows access to the area directly under the crane, an advantage over conventional cranes. The machine has a carrying capacity of three tons. The glass-enclosed driver's cab projects like a balcony high up on the turret. A further advantage of the three-leg crane over conventional ones with four-point support is that it easily adjusts to slight displacements of the runway. The crane also is lighter in weight and less expensive to operate than ordinary cranes.

☐ America's known reserves of liquid petroleum were increased by 2.7 billion barrels during the last year.





Tool Detects Minute Scratches

Scratches as small as one millionth of an inch are detected by a new portable precision instrument. It was developed to insure accuracy of highly finished surfaces of machined parts. A stylus is fitted to an electronic pickup. When the stylus is drawn across the "peaks" and "valleys" of a machined surface, the microscopic up-and-down motion is transformed into electrical signals which are recorded on a meter dial.

Workshop Accompanies Paris Cabby

Pierre Alidiere, a 60-year-old Paris cabby, isn't one to allow business to interfere with pleasure. Pierre's pleasure—and avocation—is inventing. Installed next to the driver's seat of his old hack is a miniature workshop where he tinkers on new gadgets and inventions and does any odd repair jobs his cab needs. Alidiere has worked up 89 major inventions, many of them patented. On the roof of his taxi is a windmill which drives a 12-volt generator continuously feeding a spare battery used to power the refrigerator, lights and radio when the engine is shut off. He filched the tubing from his wife's aspirator to make a combination speaking tube and loudspeaker through which he can shout warnings at jaywalkers. An old Klaxon horn—protect-



ed by a wire salad basket and located just above the windshield—emerged as a ventilating unit.





Oklahomans Build Oil-Pipe and Sheet-Metal Church

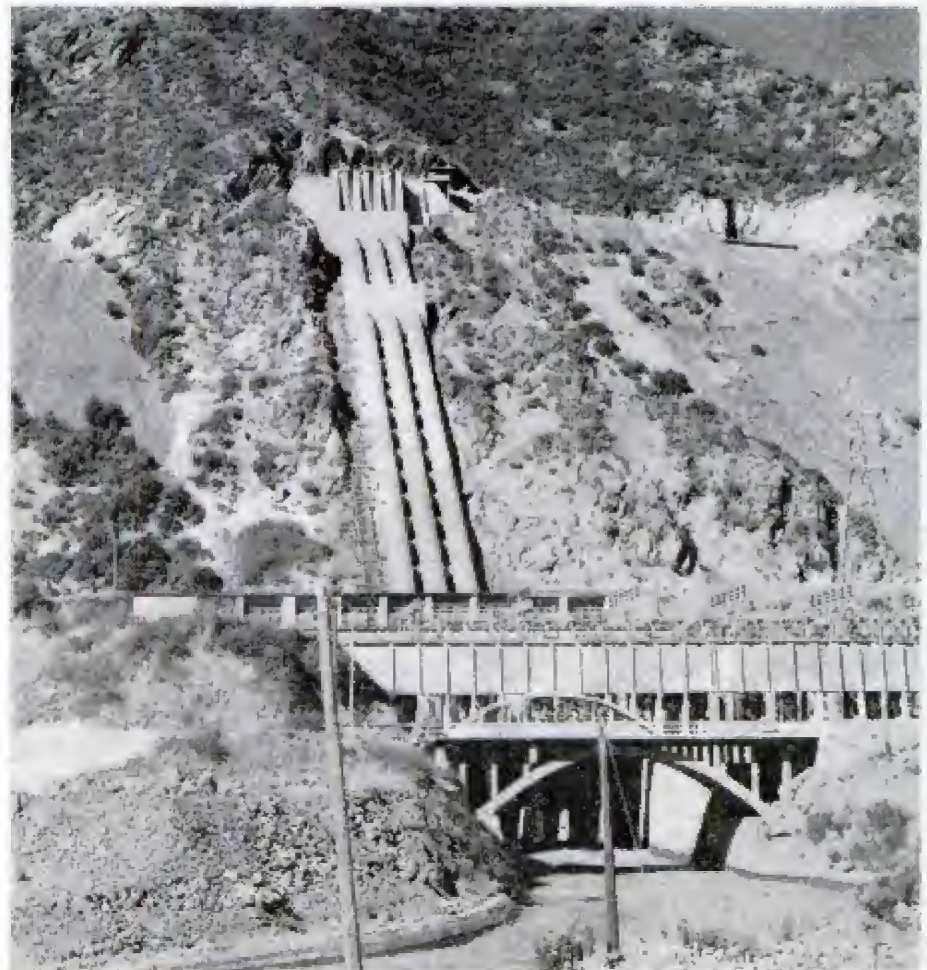
There's a unique story behind a strange structure that rises out of the plains of western Oklahoma. Back in 1947, members of the Hopewell Baptist Church wanted a new building but didn't have enough money to hire architects, carpenters and stonemasons. One member persuaded an instructor and a student in Oklahoma University's department of architecture to turn out plans for the church. Then farmers, roustabouts and pipe-liners of the oil country scoured the countryside for materials, find-

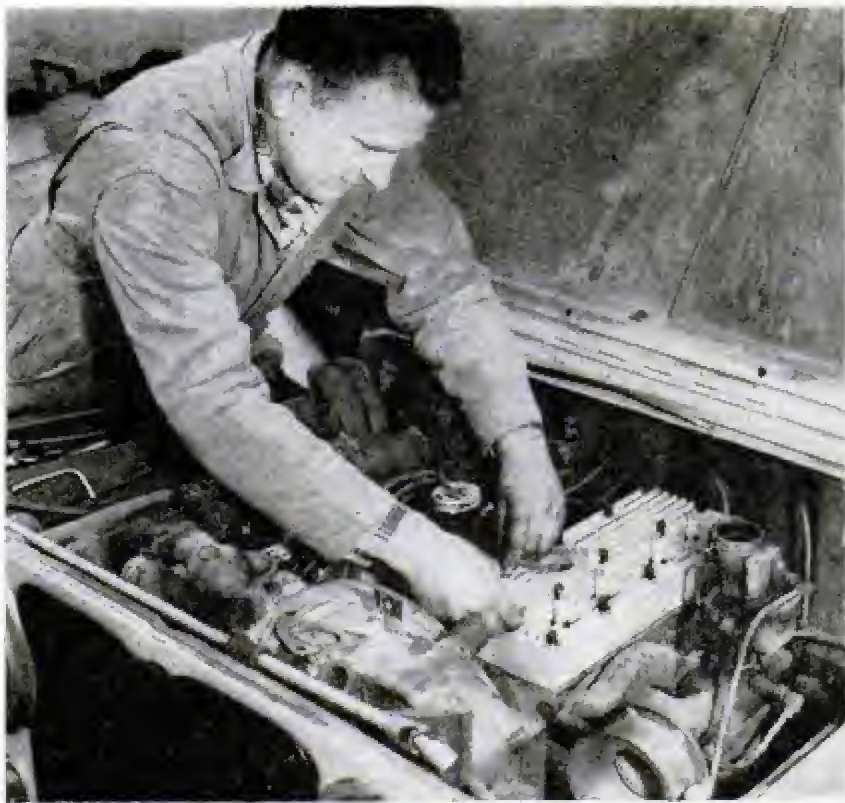
ing many of them in the oil fields. Month after month the men reported for work on the church after completing their own day's work. The completed building is cone-shaped and has a framework made of oil-well pipe. Windowpanes are fashioned from auto plate glass and the interior walls are lined with galvanized sheet iron. The chandelier is handmade from baking tins, pipe, wire and pieces of glass. Though they started from scratch, the members now value their church at \$50,000.

Chilean Power

Water power from the perpetually snow-capped Andes is helping make the industries of Chile independent of imports of oil by producing millions of kilowatts of electricity. The water pours down the mountainsides in large penstocks to spin turbines and generators. Because of the difficult terrain in which the generating stations are located, most of the construction work had to be done with a minimum use of labor-saving machinery.

¶ Columbia University is developing treatments to make textiles resistant to fire through the use, oddly enough, of compounds of phosphorus — the same element used to start fires in match heads and incendiary bombs.





Hot Rod Magazine

Installation of a high-compression head provides the extra power needed for high performance when all eight wheels are used. The same head also fits the engine of a Henry J automobile. Below, the "beefed up" Jeep easily conquers an incline too steep for other cars to climb

Eight-Wheel Jeep Takes Steepest Hills

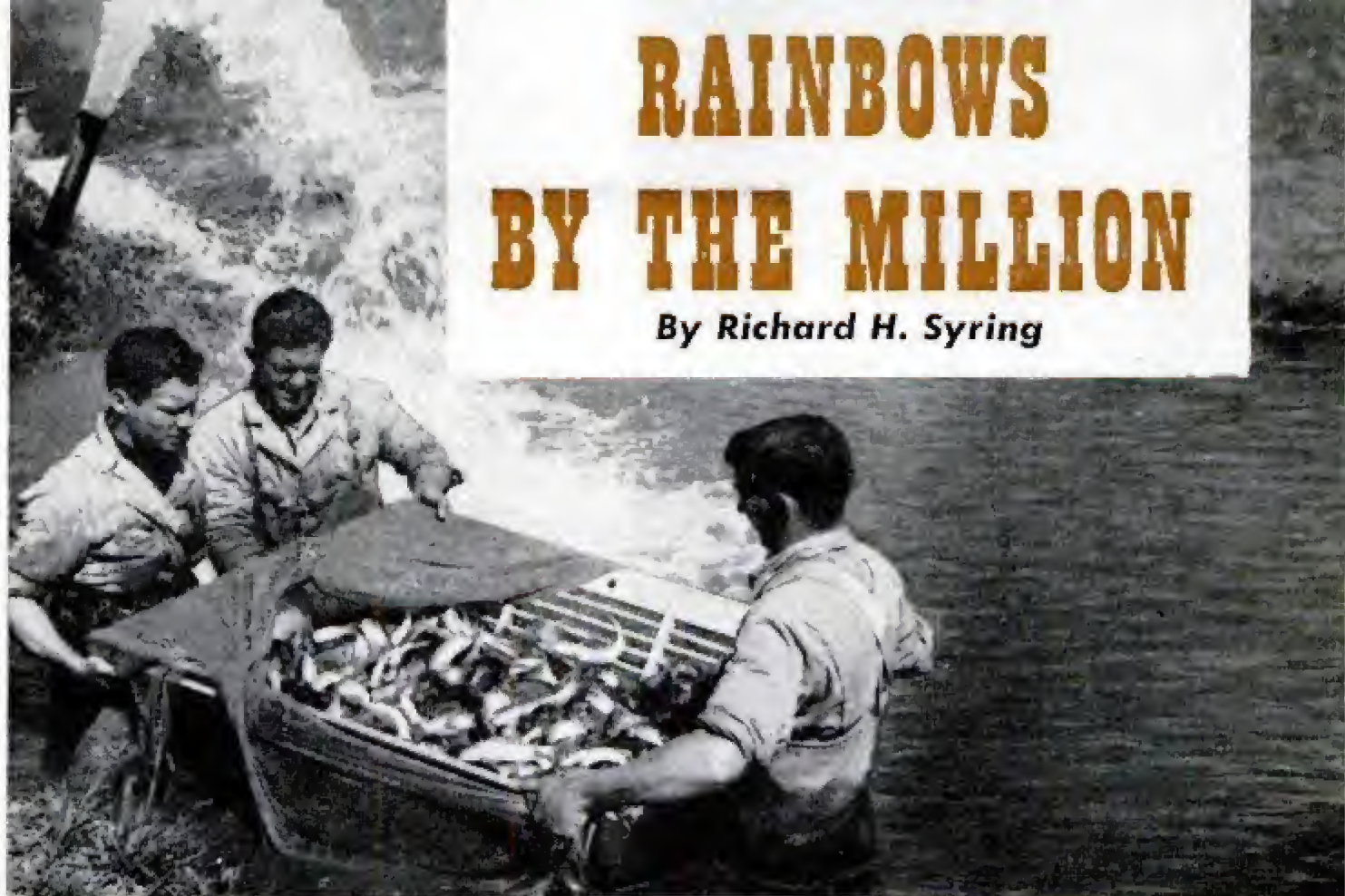
SPORTSMEN and farmers who attach eight wheels to a standard four-wheel-drive Jeep can climb practically any hill and plow through mud without stalling. The Jeep will storm over the top of the steepest incline like a motorcycle. Steering is not affected materially when the Jeep is in motion. The extra wheels are attached to the standard wheel bolts without special tools or a jack by means of heat-treated aluminum spools and extender bolts. The dual wheels may be used on the rear alone or all around, in which case a high-compression head is fitted to the engine to provide additional power. The same head also fits the Henry J.



Along with its unique hill-climbing qualities, the eight-wheeler can plow through mud without stalling

RAINBOWS BY THE MILLION

By Richard H. Syring



Here's one way to go trout fishing—not very sporting, perhaps, but there's no doubt that it's successful

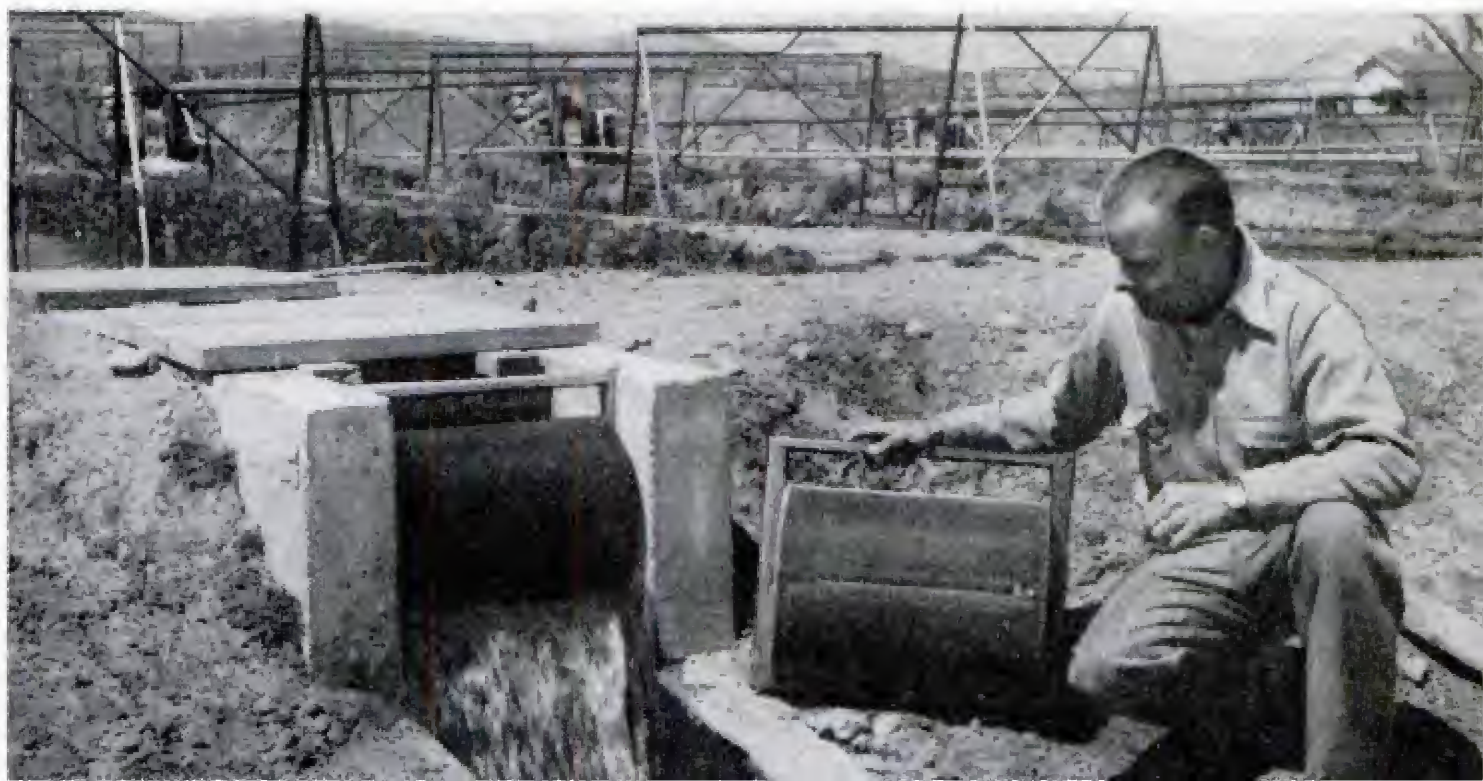
BBETTER THROW that fishing pole away. If you want trout, why not raise 'em? And make a little money, too. But you may want to begin on a much smaller scale than Paul K. Christman of Reno, Nev.

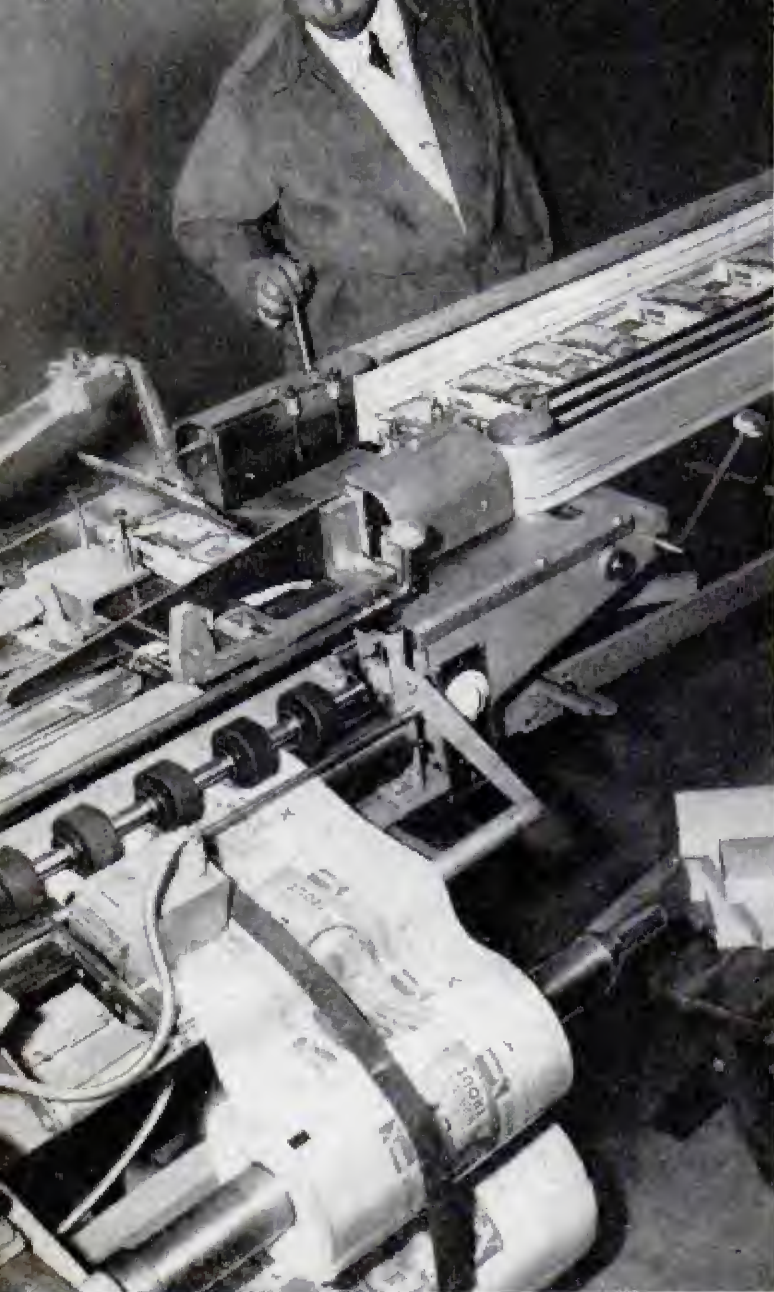
Christman does it in a big way. His Xman Trout Ranch is reputed to be the largest in the world. All year 'round, he has 2,500,000 rainbow trout growing bigger

in ponds on the 29-acre ranch located in the shadows of the high Sierra mountains.

Each day workers scoop up several thousand of these palatable beauties. Twenty minutes after they leave the water they are eviscerated, packaged and quick-frozen. When that rainbow lands in its cellophane jacket, it is approximately one year old. In this piscatorial paradise the trout grow

Water flows between ponds through spillways. Unwanted materials are removed by these self-cleaning weirs





One-pound boxes, containing four frozen trout, are automatically wrapped at the ranch. Below, the eggs are hatched in these troughs in the incubation room

from a tiny egg to $\frac{1}{4}$ pound in just about 12 months.

The Xman Trout Ranch has an annual capacity of 400,000 pounds. Fresher than those from a fisherman's creel, Xman trout have created a carriage-trade demand that exceeds the supply.

Thirty-six trout ponds, each 20 feet wide, 125 feet long and $3\frac{1}{2}$ feet deep, are located 12 to a terrace. These ponds and a main 200-foot reservoir are supplied with fresh well water at about 58 degrees F.

Extra oxygen is added to the water by throwing it high in the air from six-inch header pipes. Another system of pipes with spray outlets is suspended over the ponds to provide additional aeration when needed. The incoming well water is piped to the ponds on the upper terrace. It flows by gravity through revolving weirs, located in concrete outlets, into ponds on the two lower terraces and into the reservoir.

Each spillway between the ponds has a self-cleaning screen. Paddle wheels within each weir, operated on a reverse gear, draw off moss, algae and other unwanted materials that may prove hazardous to fish life into an irrigation ditch.

The paddle wheels further aerate the water and the weirs prevent the fish from moving to the next pond. Trout must be separated according to size since the larger fish often try to eat the smaller ones.

The rainbow eggs come by air from Idaho, Montana and Canada. An average ice-packed shipment is about 250,000 eggs on small screen-bottomed trays covered with cheesecloth. The eggs are so small that it takes 390 to make an ounce.

On arrival, the "green" eggs, so-called because of their early stage of development



and not their color, are placed immediately in troughs of fresh water in the incubation room. In five to seven days, the embryos, now called "fry," break from the egg sacs. They lie on the trough bottoms for 15 to 20 days, feeding on the remains of the egg sacs. After the sacs are consumed, the fry rise to the surface and then are fed finely ground beef liver. A hatch of 95 percent of the eggs is considered normal.

The tiny fry are fed once an hour for the next two weeks. Then feeding is reduced to three times daily, later twice daily. As soon as the fry show an ability to eat well, they are moved to outside rearing ponds. At this stage they are one inch long and are known as "fingerlings." Not until they are two to three inches long are they called trout. When the trout are six to seven inches long, they go into the larger growing ponds.

Everything possible is done to make life safe and comfortable for the pampered trout. They grow healthier faster if water temperature is kept at 58 to 60 degrees F. In summertime, ponds are covered with Army surplus camouflage nets to keep off the sun's rays. When oxygen in the water tests low, the sprays are turned on to stir up the water.

Trout are affected by the seasons, too. They eat less and use less oxygen in the winter. Rainbows are fed a balanced diet once daily, consisting mainly of ground beef, wheat, wheat germ, yeast and vitamin B₁₂. Every day some 1500 to 2000 pounds of these ingredients are put through a grinder and fed to the trout.

Only 40 pounds of trout are taken from the water at any one time. The fish are caught with a seine, which allows the smaller trout to escape, or with a hand net. The smaller fish that escape are recaptured and placed in pools with fish of their approximate size.

Once the trout are out of the water permanently, general manager William Mulheron's big crew works speedily. Tubs of trout are hurried to the cleaning room, where two men clean four trout a minute!

From the cleaning tubs, the trout go through a cold-water bath and then to the packaging tables, each to be sealed separately in cellophane. With four rainbows to the package, these one-pound packages go through a wrapping and labeling machine at the rate of 1800 an hour.

Then the trout are ready for freezing. Packages are stacked on metal racks and moved to the quick-freeze room where the fish are frozen at 30 degrees below zero.

Usually, a day's operation completely loads the freezer. The next day, the frozen cartons of fish are cased and stacked in low-temperature storage. Then they're ready for shipment. ★ ★ ★



No, it's not spaghetti—it's a balanced ration for trout, containing beef, yeast, wheat germ, vitamins



After cleaning, the custom-raised trout are weighed and packaged. Below, fresh from the last pond, the year-old beauties are on their way to your kitchen





Giant Leaf Shredder Does Job of 20 Maintenance Workers

With a combination vacuum cleaner, hammer mill and composting unit, the University of Illinois has solved its annual leaf-raking headaches. A machine devised by R. S. Chamberlin of the university staff sucks up the fallen leaves, grinds them and blows them back to the ground where they

serve as a valuable soil conditioner. Leaf collecting on the 450-acre campus with its 4000 trees formerly took a dozen men six weeks' time. Pulled by a tractor, the Chamberlin machine does the work of 20 men hourly and eliminates all the trucking and burning that formerly were necessary.



Specimen is placed in microscope. X rays pass through tube to film, left

X-Ray Microscope

Providing a magnification of 150 diameters, an X-ray microscope developed at Stanford University gives a distinct image to objects a hundred-thousandth of an inch in size. Its four mirrors have to be exceedingly accurate—not deviating more than a millionth of a centimeter from a perfect contour. Performance of the microscope lies between that of the best optical microscope and the electron microscope. It operates in helium and can be used on living tissue without injury.

Neon Chandelier Has Flowing Lines

Neon tubes shaped to smooth flowing curves form chandeliers in modern German buildings. Because of the adaptability of the neon tube, many interesting shapes can be created with the tubes of light. In one Berlin shop, a neon chandelier illuminates a stairway. Other uses include a large ceiling fixture in a new theater.



the POPULAR MECHANICS CRAFTSMAN

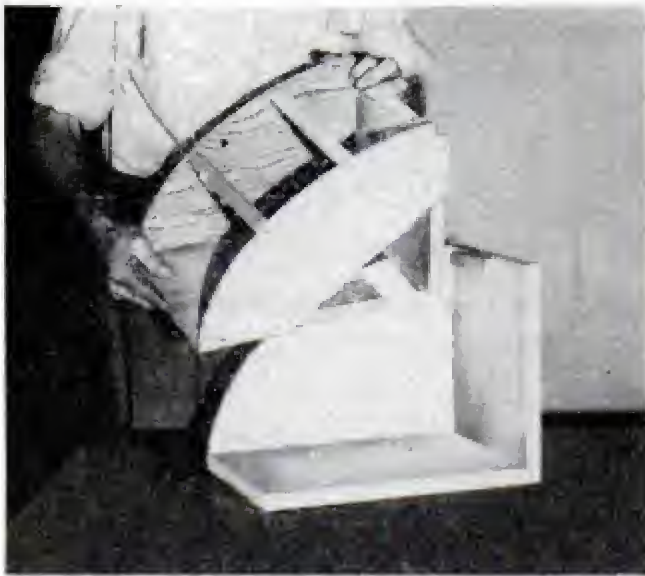


Modern Console Has Mirror Back

By Keith Vining

FOR BRIGHTENING dark hallways or adding a decorative detail to an expanse of plain wall, this modern console table has several functional features of novel application. Hinged compartments alternate with mirror-backed shelves in a staggered design that is both attractive and useful. It will be noted that the design permits several variations. For example, the top compartment and shelf may be omitted and all parts duplicated and assembled into two matching end tables suitable for use with a modern sofa. Or, an extra compartment and shelf may be added to make a

"highboy" of distinctive modern design. In either case the construction procedure is essentially the same. Before cutting stock, note that the top shelf is step-rabbeted on the back edge, the step extending only $\frac{1}{2}$ the width. All other shelves are rabbeted also, the single rabbet extending only $\frac{1}{2}$ the width. The same size single rabbet is cut on the back corners of the divider. Here the rabbets are run the full length of the piece on both corners. When the parts are assembled the edges of the mirrors are housed in the rabbets. Lay out the shelves, also the top, as in the upper detail on the



After assembling the bottom, back and one end of each compartment, the frontpiece is fitted over a form



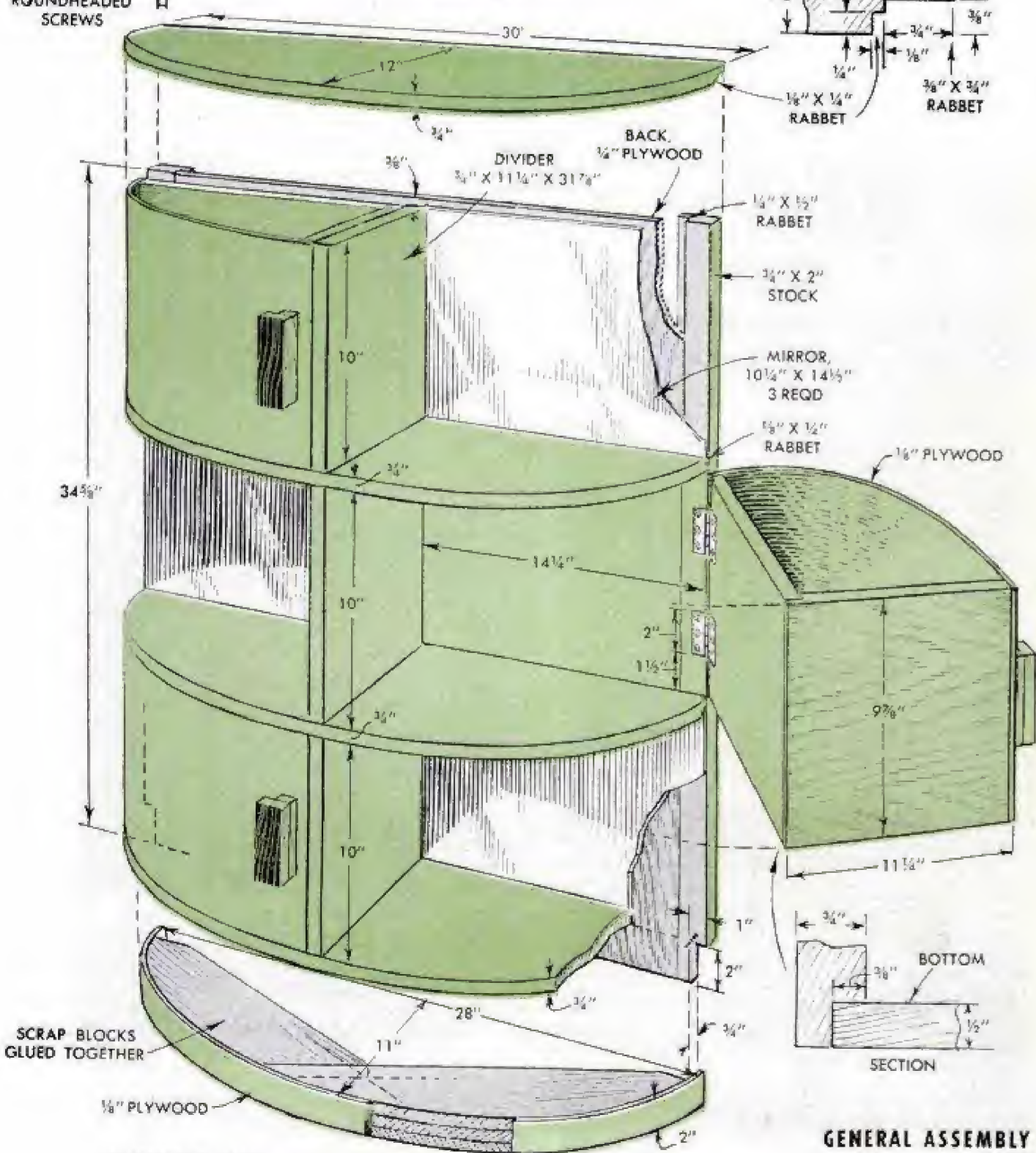
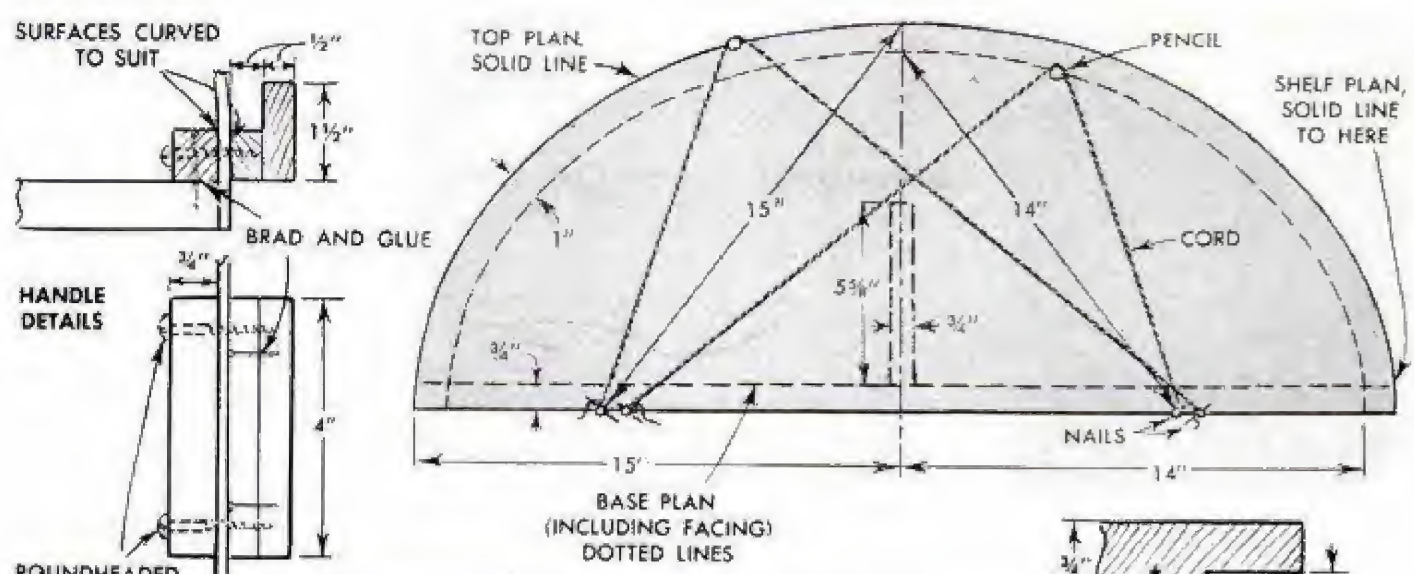
Above, compartment frontpiece is glued and nailed in place with brads. Heads are set below surface and holes filled. Below, after bandsawing to contour and applying facing, bottom frame is nailed to shelf



opposite page. Note that the two center shelves and divider are notched so that they interlock when assembled. Bandsaw the parts to the rough size and notch them so that they slide smoothly together. Then plane and sand the curved edges to the finish dimensions. Rabbet the back edges of the top, shelves and dividers. The stopped rabbets are cut by marking the center of the work and then making a witness mark on the ripping fence of the saw table directly above the center of the arbor. After the dado head has been set to cut to the required depth, the ripping fence is brought up and locked at the correct position. The work is then run over the dado head and stopped when the marks on the work and the fence coincide.

The back panel is framed on both sides with a rabbeted strip that houses the edges which otherwise would be exposed. These strips are screwed to the shelves and the top when the parts have been positioned for assembly. Note that the lower ends of the strips are notched to fit over the ends of the bottom facing. The bottom frame consists of six pieces of scrap stock which are sandwiched or stacked to three thicknesses with the ends overlapping at the center. After gluing, the frame is bandsawed to contour laid out from the dotted line in the upper detail on the opposite page. Save all the waste pieces and use them as clamp blocks when gluing the plywood facing strip in place. Attach the base to the cabinet with nails or screws and glue as in the lower photo at the left.

The back and endpiece of each compartment are of $\frac{3}{4}$ in. stock, and are joined with a rabbeted joint as shown in the detail. The bottoms are of $\frac{1}{2}$ -in. plywood, the front edges being sawed and finished to the same curve as the shelves. Now, before attaching the curved plywood fronts, clamp each partly assembled compartment in place and drill holes for the hinge screws through the compartment backs and into the rabbeted back strips. Wedge each compartment in place to assure that the hinge screws are properly located. Then make the assembly form, shown in the top and center photos at the left, and use the form to shape the plywood frontpieces. Clamp the form in place inside the compartment, spread glue on the joining surfaces and then nail the plywood to the bottom, side and back with small brads. Set the heads of the brads and fill the holes. Make and attach the compartment handles as in the upper left-hand detail on the opposite page. Sand the exposed parts thoroughly and round all edges slightly. Finish the cabinet with an undercoater and two coats of enamel in the color desired. Then slide the mirrors into place in the rabbets. ★ ★ ★





Scrub Brush for Cleaning Shoes Adds Safety Feature to Ladder

As a safeguard against the possibility of accidentally slipping because of muddy shoe soles when going up or down a ladder, nail a small, inexpensive scrub brush to the lower ladder rung as indicated. The brush, when placed in this position, will provide a convenient means for wiping the soles of your shoes before ascending the ladder.—Bess Ritter, New York City.

Waterproof Garden Markers

Your garden markers will stay legible throughout the season if each label is protected with an inverted glass vial. After printing the necessary data on the label, roll the paper and insert it face-side-out in a small vial of the type in which tablets and lozenges are sold. Then slip the vial over the end of a pencil or a length of dowel which will serve as a stake. Tape or wire the vial to the dowel so there will be no danger of its being accidentally knocked to the ground. If the vial is wired to the stake, use a small piece of cellulose tape to keep the label from falling

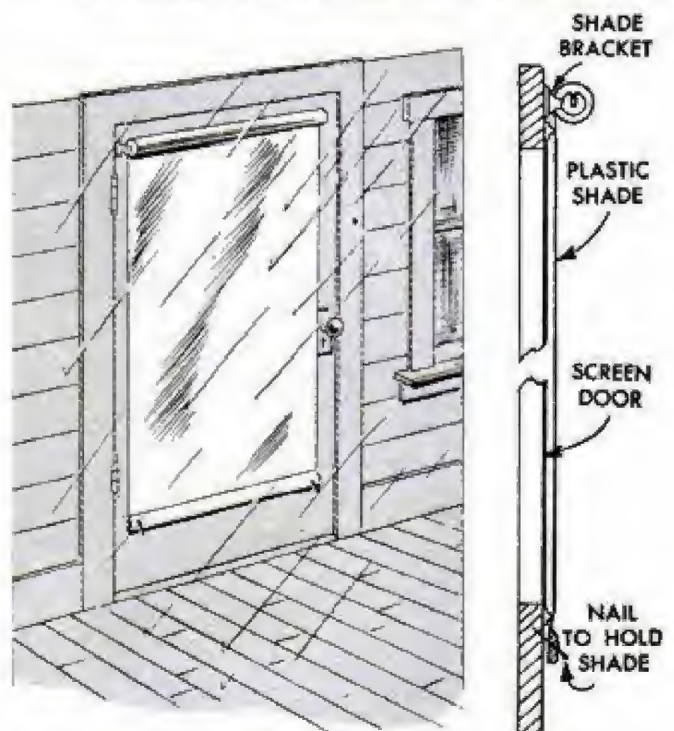


out of position. A flat stake can be substituted for the dowel simply by wiring or taping the vial to one side of the stake.

Storm Curtain of Plastic Cloth Rolls Up When Not Needed

Many new homes similar to my own unfortunately were not provided with canopies or porches for protecting the entrance from blowing rain. Not only can a driving rain cause the inside door to warp and the veneer to crack and peel, but it also can force water under the door and damage the flooring, as it did in my house. For a time I tried replacing the screen section of the combination door with the storm section every time storm clouds gathered—a tedious and time-consuming job, indeed. To eliminate the necessity of this routine, I fitted a window-shade roller with a piece of plastic cloth which was long enough to cover the screen portion of the door completely. The roller was mounted at the top of the door with regular brackets, while finishing nails were driven in the lower part of the door to anchor the bottom end of the cloth when it is drawn. After hemming the bottom edge of the curtain to receive the slat from an old window shade, I drilled holes in the slat to make it possible to slip the end of the curtain over the nails. Now, at the first signs of an approaching storm, I simply draw the curtain and hook it over the nails to provide the protection desired. After the storm has passed, the curtain is slipped off the nails and rolled up, making normal use of the screen door possible again in a matter of seconds. In winter the brackets are removed and stored together with the curtain and roller.

Thomas P. Ramirez, Fond du Lac, Wis.



How to Build RETAINING WALLS

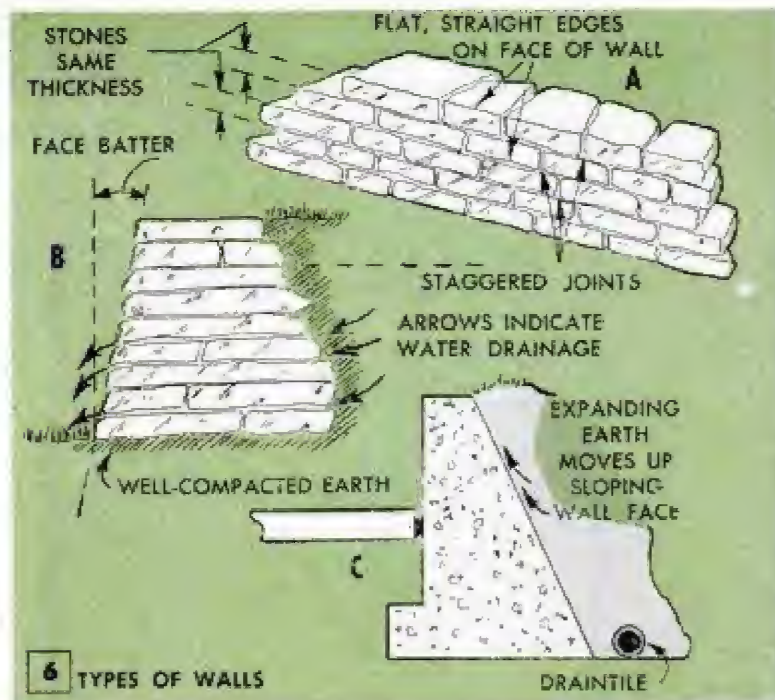
By E. R. Haan

SLOPING LAWNS often can be given a much better appearance by edging them with easily built retaining walls of stone or concrete. On lawns having steep banks, which make them subject to fast erosion and also difficult to cut, retaining walls afford the additional advantages of reducing erosion and simplifying maintenance considerably.

Many applications: Fig. 1 shows how a low flagstone retaining wall is used to obtain two level terraces instead of a sharp drop in grading across the front of a house. Note how the wall pictured in Fig. 2 eliminates a steep bank along an entrance drive and front sidewalk. Fig. 3 shows a retaining wall which is used to protect an old, valuable tree where the grade all around the tree was lowered to blend in with street paving. Foundation terraces, Fig. 4, which often are used to enclose flowers or shrubs, are particularly desirable where a house is set on a high foundation. The terrace and its plantings give a lower, more modern appearance to the house. Another application is to separate adjoining lots with a low retaining wall to make each one more nearly level. A lawn having a pronounced slope may be divided similarly into several level or slightly sloping terraces.

Drainage and frost precautions: Lack of good drainage and damage from frost can ruin a good retaining wall within a few years. Walls built of loose flagstones automatically provide drainage through the joints, Fig. 6, detail B. However, a solid wall holds water behind it and requires drain tile along the base on the inside of the wall as in detail C. The tile is led to a lower location, such as a dry well or a sewer. Even with proper drainage provided, soil frequently holds enough moisture by capillary attraction to permit some expansion by frost. Loose-stone walls have sufficient flexibility to move with the soil upon freezing and thawing. For example, the one pictured in Fig. 5 has kept its original shape and position for 17 years in a climate where alternate freezing and thawing occur frequently during winter. To withstand lateral pressure of freezing soil, solid walls





should be built much wider at the base than at the top, as in detail C, the inner side sloping acutely. This side, if smooth, will further help to relieve lateral pressure as it will allow freezing ground to slip upwards as it expands.

Loose-flagstone walls: Retaining walls of flagstone, built loosely without mortar, are the easiest to construct. Start by laying the stones on undisturbed earth rather than on loose fill which will settle. The stones of each course should be of relatively equal thickness, as in Fig. 6, detail A, to keep the wall level. However, for variation, a few stones the thickness of two or three courses may be placed in the wall at random. Set the stones so that straight, flat edges will be exposed.

When it becomes necessary to chip a stone to get a straight edge, use a cold chisel and a hammer. The basic idea of fracturing stone is quite similar to glass cutting. First score a guide line on each side, one directly over the other, by running the chisel along a straight edge. Next, nick both edges about $\frac{1}{8}$ in. deep to connect the scored lines. Then lay the stone flat on the ground and tap it with the hammer and chisel to make the score lines about $\frac{1}{8}$ in. deep. After thus deepening the score lines continuously, tap with sharper blows from the center toward the edges. If this is done care-

fully, the stone will fracture straight across like the one shown in Fig. 7. This can be accomplished in just a few minutes. Scoring confines the fracture where it is wanted and tapping weakens the stone. Don't try to make a straight break with a few heavy blows, as the line of fracture cannot then be controlled.

Joints between stones in any course should be bridged by stones of the course above, in the manner that bricks and shingles are laid. It also is best to lay the stones either level or at a very slight forward pitch for proper drainage. If the face of a wall is vertical it will appear to lean forward, this illusion becoming more apparent if the wall is higher than 3 ft. Therefore, on walls over a foot high the face should be given some inclination or "face batter," varying from 1 to 4 in., or even more, per foot of height.

The width of a loose-stone wall may be as little as 8 in. if the wall does not exceed a height of 1 ft. A 10 to 12-in. width is better for a wall 2 ft. high, and a 12 to 16-in. width for a 3 or 4-ft. wall. Spread some soil over each course to "bed" the next course. This also permits creeping rock-garden plants to take root and spread. The plants will keep the soil from washing out of the crevices during heavy rains. In many cases foliage adds to the over-all appearance of a retaining wall.

Solid-masonry walls: Solid retaining walls higher than 3 ft. generally are built of concrete, as pictured in Fig. 8. If a brick or stone facing is desired this can be added. Fig. 9, detail A, shows a cross section of a properly designed concrete wall. The base should extend just below the point to which frost penetrates, and it should be poured on firm, undisturbed earth. If the excavation



Photo courtesy Portland Cement Association

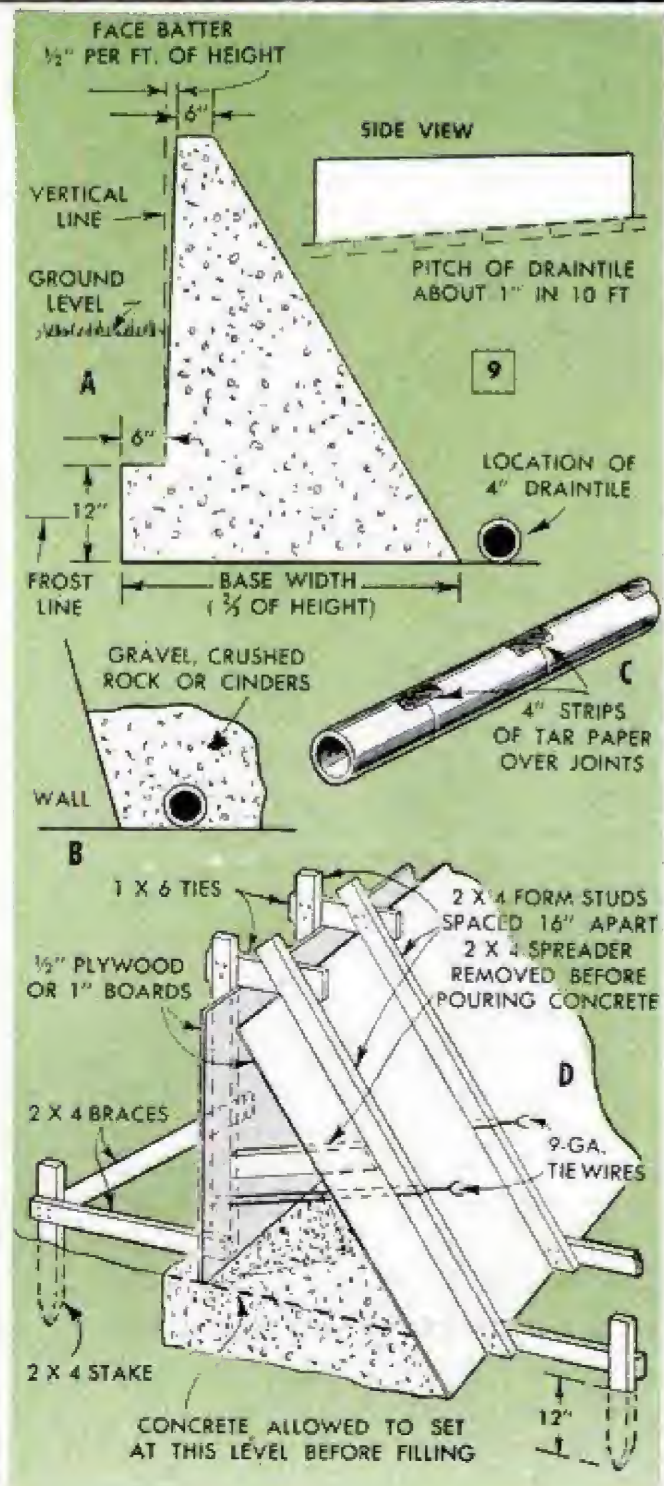
is accidentally carried too low, don't fill with earth but increase the depth of the wall instead. Lay draitile at the inside of the wall at base level as in details A and B. Butt the tile together and provide a slight drainage pitch. The latter can be checked with a level. Then put a 4-in.-wide strip of tar paper over each joint, detail C, to prevent earth from falling inside the tile. Finally, cover the tile with a 12-in. layer of gravel or crushed stone.

Walls less than 5 ft. high should have a minimum top thickness of 5 in., while those over 5 ft. high should have a top at least 8 in. thick. The base width of a solid-masonry retaining wall should be approximately $\frac{2}{3}$ of the wall height. Thus, the bases of walls 3, 4, 6 and 8 ft. high should be 2, 2½, 4 and 5½ ft. wide respectively. As in the case of the stone walls, face batter of ½ in. or more per foot of height is desired so that the face will not appear to lean outward.

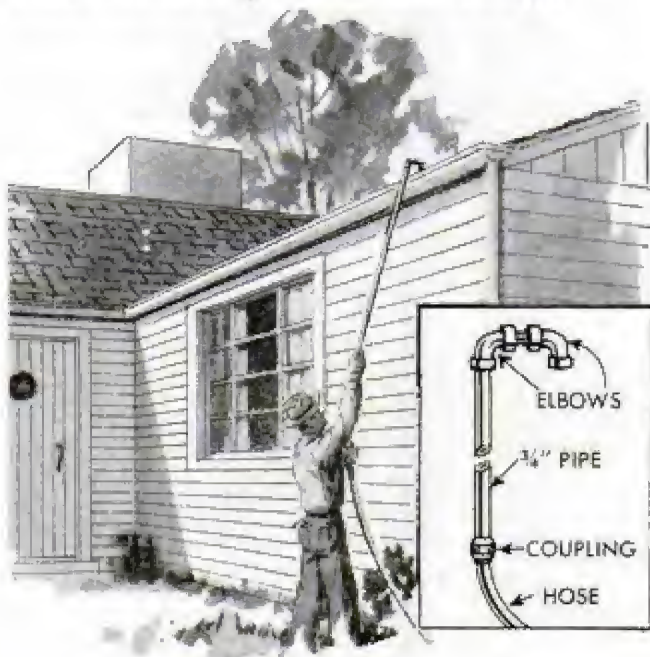
Large retaining walls of concrete are major undertakings and should be built by concrete contractors. However, the average homeowner can build forms for small retaining walls as in Fig. 9, detail D. Get ready-mixed concrete if you can, to eliminate the backbreaking labor of mixing by hand. If you mix your own concrete, use a mix consisting of 1-part portland cement, 2¾ parts of clean, sharp sand and 4 parts of gravel or crushed stone, the latter being no larger than 1½ in. in diameter. After these ingredients have been well mixed, add 6¼ gal. of clean water per sack of cement if the sand is damp; 5½ gal. if it is wet. Keep the forms soaked with water for a week after pouring the concrete so it can cure slowly to attain maximum strength.

★ ★ ★

☐ A coat of thin shellac applied to the hard covers of children's books will help them to withstand the hard usage they receive.



Pipe Extension on Garden Hose Aids Cleaning of Eaves Trough



The cleaning of eaves troughs on a one-story, ranch type of house can be accomplished with little difficulty provided you equip yourself with this handy pipe extension for use with a garden hose. Consisting of a 6-ft. length of $\frac{3}{4}$ -in. pipe fitted with a coupling at one end and two elbows at the other as shown, the extension makes it possible to stand on the ground while flushing leaves, sticks and dirt from the troughs.—Ed Packer, Chicago.

Balancing Weights Colored To Match Wheel Rim



Although essential, car-wheel weights are always rather unsightly and more especially so when installed on light colored rims. One car owner has adopted the practice of coating the weights at regular intervals with a touch-up enamel selected to match the color of the wheel rims. The matching enamel effectively camouflages the weights so that they are not noticeable, even at short distances.

R. Hanscom, Elmhurst, Ill.

Wooden Boats Caulked With Soap When Taken From Dry Storage

When used on a wooden boat that has been in dry storage, oakum and other caulking compounds harden and frequently cause the planking to become warped when

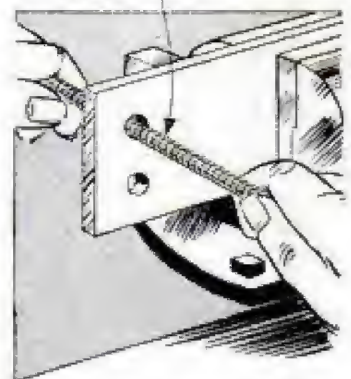
it expands again in the water. To avoid this, one boat owner caulks the seams temporarily with ordinary yellow laundry soap. The soap not only closes the seams but also seals them while the planks expand and gradually force the soap from the seams. Once the planks have returned to their normal size, the boat is removed from the water again to allow caulking of any leaky seams with a regular filler.

Kenneth O'Meara, Ft. Lauderdale, Fla.

Threaded Pipe Serves as Rasp

Lacking a rasp to remove the burr and true several holes in a piece of soft wood, one craftsman found an effective substitute in a length of threaded pipe. The pipe, which is threaded throughout its entire length, is of the type used in the construction of lamps and is applied to the work in the same manner as a rasp. Almost any threaded pipe or rod may be used if the threads are fine and sharp.—Victor Lamoy, Upper Jay, N. Y.

THREADED PIPE



Emergency Bail for Paint Can

It's an easy matter to provide a bail for a paint can so that it can be hung from a ladder or held in the hand easily. Just form a bail from a piece of stiff wire, such as coat-hanger wire, and bend the ends upward to fit under the edge of the opening in the top of the can. Be sure that the ends of the bail are bent so that they fit snugly under the depressed part of the can top. This will help prevent the possibility of the bail slipping out.



"Crystal" Lamp Base From Dime-Store Glassware



Four small tumblers, three ash trays and a candy dish, all of inexpensive glass, form an attractive lamp base when assembled on a length of $\frac{3}{8}$ -in. fixture pipe. The glass parts are center-drilled, assembled on the pipe and locked in place with a nut and washer. To bore through the glass, chuck a short length of brass or steel tubing in a hand drill or drill press, and rotate with medium pressure against an oil-and-emery mixture applied to the glass. Use a putty ring to confine the abrasive to the center of the work. Raise the tubing occasionally so the abrasive can be applied directly to the cut, and if you use a drill press, run it at low speed.

A. R. Black, McKeesport, Pa.

Insulation Pulled Under Attic Floor With Steel Tape Measure

When installing blanket insulation between the joists of an attic floor, it is not necessary to remove all the floor boards. Just remove enough of the boards from both sides of the floor to permit working the insulation under the remaining boards. Set the roll of insulation on one side of the floor with the loose end placed between the joists. Then clamp a spring-type trouser hanger to the end of the insulation. From

the opposite side of the room, insert a steel tape measure under the flooring between the same pair of joists. Pay out the tapeline until you are able to grasp the end of the tape at the side of the room nearest the roll of insulation. Then slip the ring on the end of the tape over the trouser-hanger hook, and use the tape as a line to pull the insulation along under the flooring and gradually across the room.

Battery Clip Holding Abrasive Simplifies Sanding of Small Surfaces

In various workshop projects where the sanding of small surfaces is required, a twin-jaw battery clip often can serve to good advantage as a miniature sanding block. After cutting a narrow strip of sandpaper slightly wider than the clip itself, place it in the jaws of the clip as shown and stretch it tight.—John J. Rea, Urbana, Ill.



Stamp for Deleting Printing

An old rubber stamp from which the type faces have been removed will come in handy for deleting lines of printing on outdated cards or letterheads. Evenly cut, the rubber base leaves a near-solid imprint when inked and applied to paper in the usual way.—Frank Shore, New York City.

Solving Home Problems...



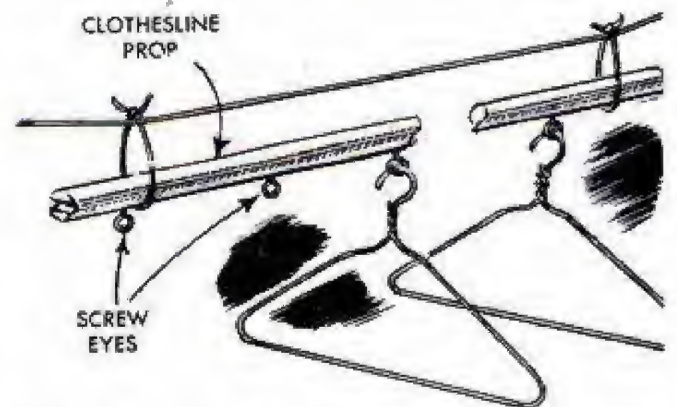
BALL-POINT PEN

BALL-POINT PEN with ink cartridge removed provides a handy tracing stylus. Pen is ideal when using carbon paper to trace faded embroidery transfers on cloth, as point will not cut through paper transfer

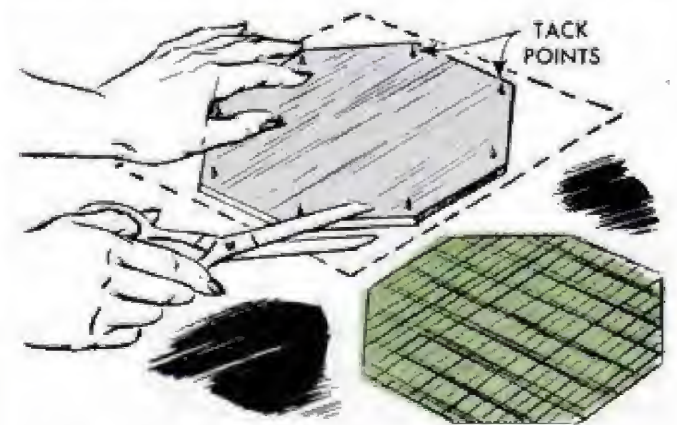
DEFROSTING REFRIGERATOR is speeded considerably by using an electric hair drier to melt ice from coils. Plug drier cord into near-by outlet and direct blast of warm air into and around the ice-cube compartment



MAGAZINE PAGES may be removed quickly and neatly, as above, by using a length of string having a button tied to one end. Button keeps the string from slipping out of place when the loose end is pulled

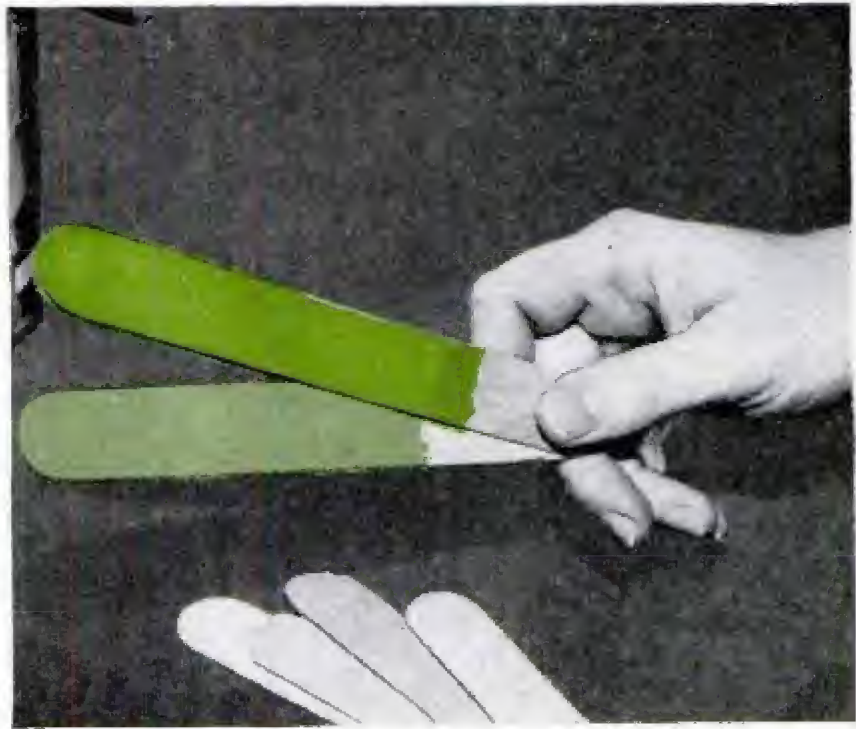


HANGER RACK made from clothesline prop, above, keeps garments aired on wire hangers from sliding together. Screw eyes driven into sides of prop receive hanger hooks. Rack is tied or wired to line

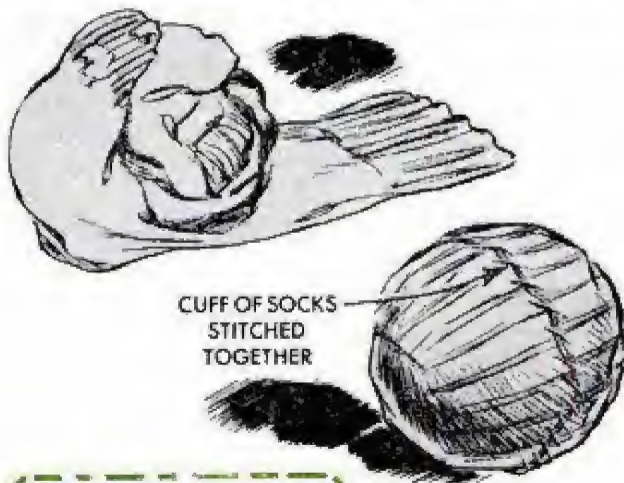


CUTTING QUILT PIECES to exact size is done rapidly with aid of a plywood pattern which holds the cloth in place while cutting. Points of carpet tacks driven through the pattern at all corners anchor the fabric

WHEN REDECORATING, you can be sure that new fabrics will harmonize with the paint used if a paint sample is carried with you to the store. A wooden tongue depressor dipped in paint and allowed to dry forms easily carried paint swatch



SAFE CHILDREN'S SOFTBALL for indoor play is made by rolling up three or four pairs of discarded socks. Use final sock to form a cover, turning back the cuff and then stitching it to retain the shape of the ball



SLOTTED CORK attached to lid of file box provides a convenient holder for recipe cards in addition to serving as a knob. Fasten the cork with glue and wood screw, driving latter from the underside of the lid

Popular Mechanics Household Hints

HEAVY COATING of paraffin helps keep furniture casters from scratching hardwood floor. To apply, rub each caster wheel with a softened cake of paraffin

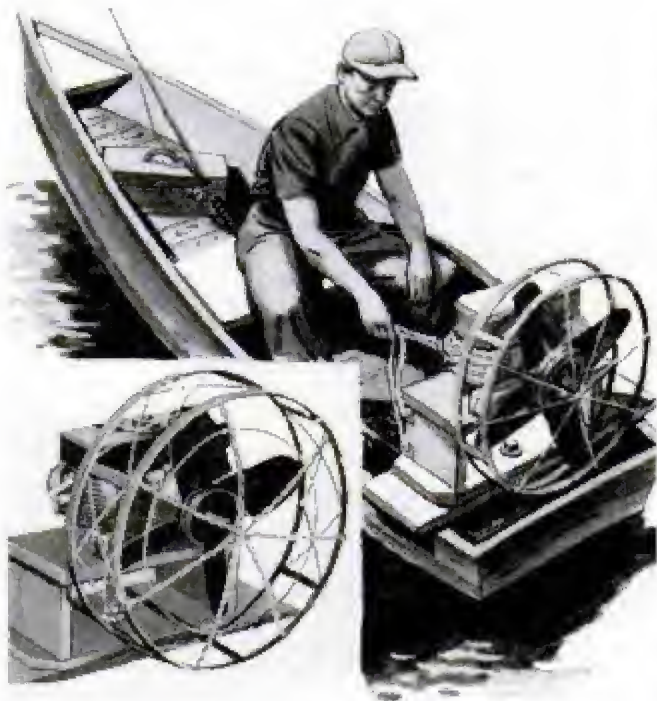
TO ATTAIN a better shoe shine, coat the shoes with paste before removing them for the night. Then polish next morning when the wax has dried thoroughly

LIPSTICK STAINS will wash readily from towels and napkins if the lipstick has been loosened by rubbing white petroleum jelly or glycerin into the stained cloth

WHEN SEWING SILK or any other material which has a tendency to slide on the machine table, slip a pillow case over the table leaf to help hold the material in its position

FOOD STAINS won't damage the cover of your favorite cookbook if the outside of the cover is coated with thin shellac. Shellacked surface can be wiped clean with damp cloth

RUBBER SHEET is held in place on crib mattress by strips of muslin sewed along the edges. Muslin strips should be wide enough to permit tucking securely under mattress



Propeller-Driven Fishing Boat

Requiring a boat of exceptionally shallow draft for river fishing, one fisherman designed and built this flat-bottom job to his own specifications and then eliminated the conventional rudder and propeller of the regular outboard motor by rigging an air drive. This consists of a 1-hp. high-speed engine of the air-cooled type mounted on a pivoted base and fitted with a propeller, or air screw, made by adapting a 1946 Ford cooling fan. The fan is mounted on the engine crankshaft and fitted with a guard made from $\frac{1}{8} \times \frac{3}{4}$ -in. flat steel. The engine and propeller are mounted on an open hardwood base which is pivoted on a sub-base attached to the gunwales of the boat about 12 in. in front of the transom. Steering lines attached to the ends of the pivoted base permit the boat to be steered simply by swinging the engine and propeller right or left by means of the lines. Although this arrangement served the purpose of the original builder, it could be elaborated if desired by attaching the steering lines to a conventional steering-wheel assembly.

Charles W. Martz, Williamsport, Pa.

Storing Small Amounts of Paint

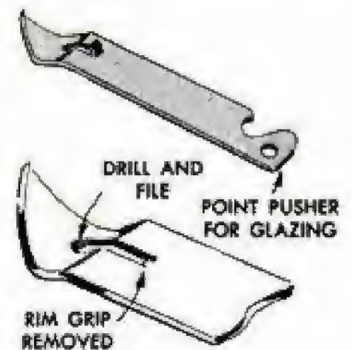
Saving left-over paint often proves worth-while for touch-up jobs around the house, but the paint usually oxidizes quickly if left in its original can. To prevent a skin from forming on top of the paint, pour it into glass jars having screw-type lids which will make an airtight seal. Various sizes of these jars are used to package food products, some of them holding as much as a quart. However, for especially small quantities of paint, baby-food jars having press-on lids with rubber seals provide con-

venient containers. Although the clear-glass jars permit easy selection of the particular color of paint desired, it is best to label the jars with type of paint and color name if several similar colors are kept on hand. Use gummed paper or adhesive tape for a label or write directly on the glass with a grease pencil.

George H. Plough, Woods Hole, Mass.

Can Opener Provides Handy Tool For Rounding Sharp Edges

A can opener of the type shown may be converted into a useful tool for rounding sharp edges on furniture. First, break off the rim grip and drill a $\frac{1}{4}$ -in. hole at the opposite end of the slot. Then, using a rat-tail file, bevel the hole to form a sharp cutting edge where it meets the outer curved surface of the opener. The tool also makes a handy point-pusher for use in glazing when held so that its outer curved end fits snugly in the palm of the hand.—Norbert Engels, South Bend, Ind.



Keeping Moths From Trout Flies

No longer need you worry about moths getting at your favorite trout flies from one fishing season to the next. Simply store the flies in an air-tight can and add a few moth crystals. A 1-gal. paint can makes an excellent container for this purpose. A can which previously had contained a water-soluble paint can be cleaned very easily with soap and water. Be sure to clean the cover and groove thoroughly so that the cover will fit tightly.

Clyde Allison, Cadillac, Mich.

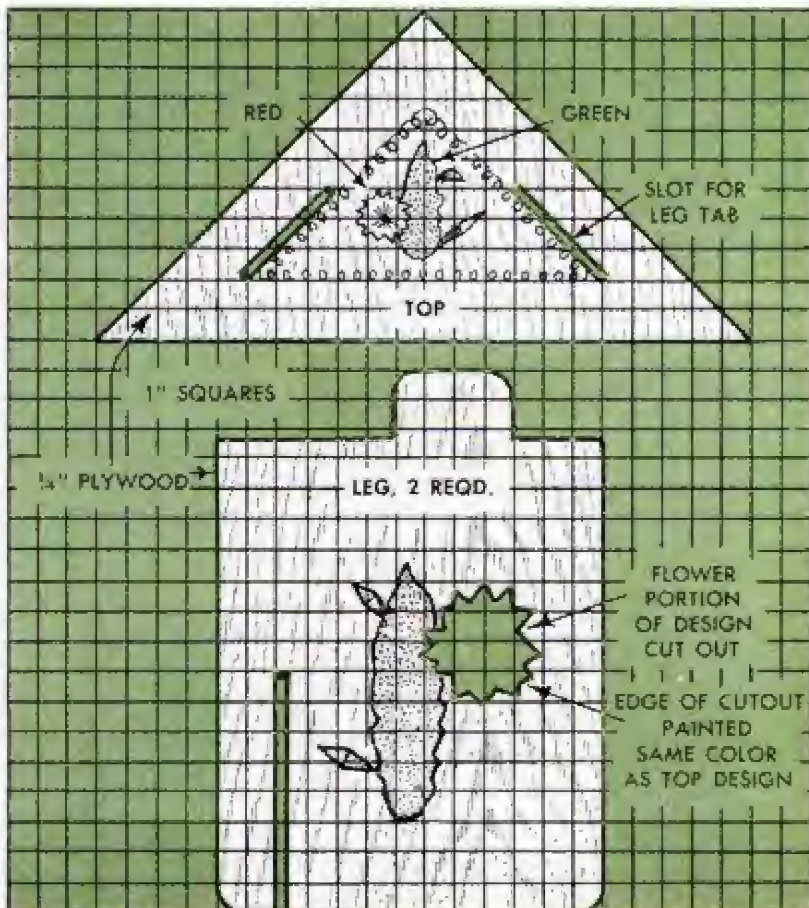
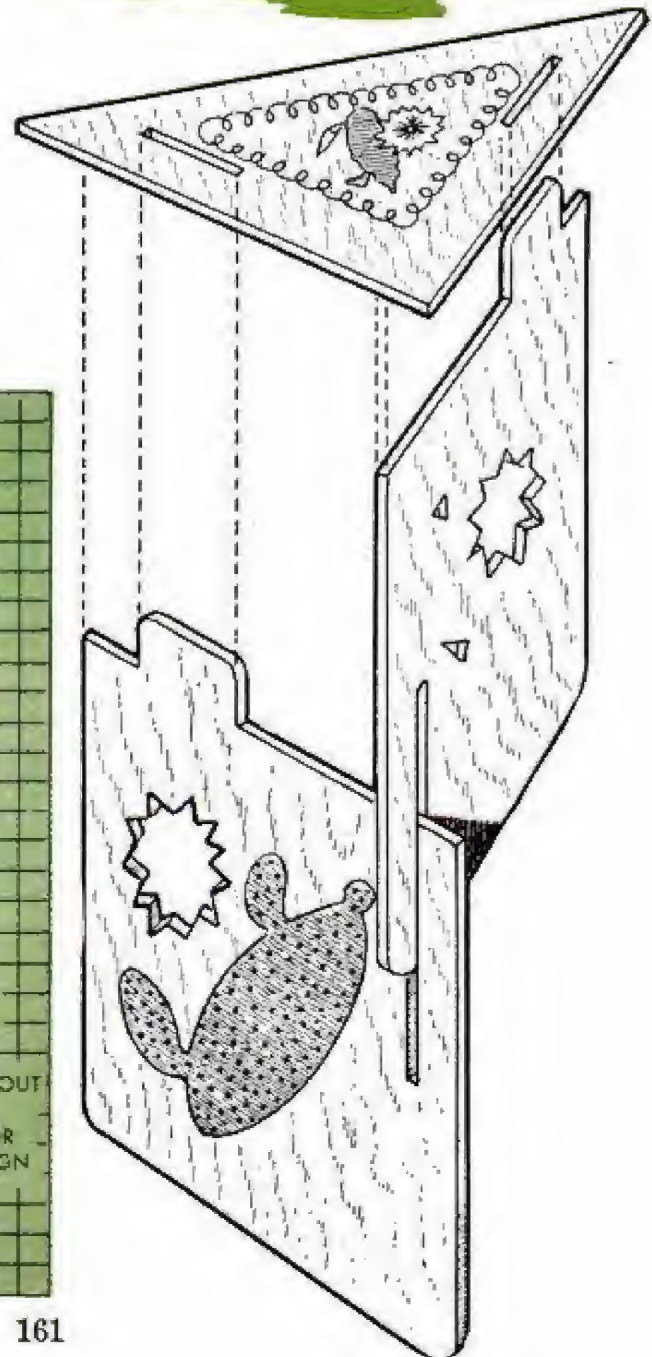


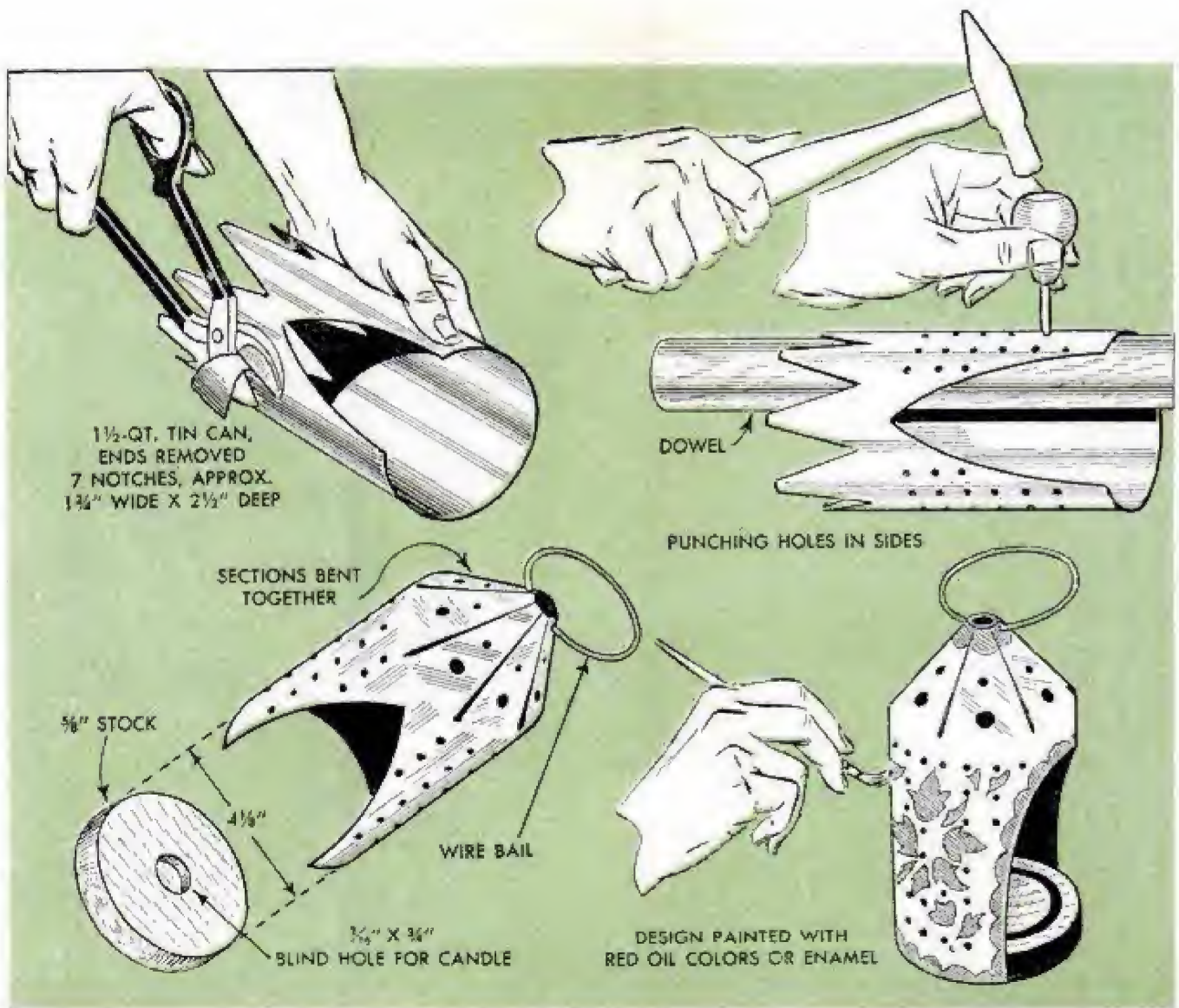
Outdoor SNACK TABLES AND LANTERN

By Roberta L. Fairall

ON SWELTERING summer nights when informal dining on the lawn is in order, nothing makes entertaining so convenient as a set of these take-apart snack tables. Consisting of but three interlocking parts, each table is set up and dismantled easily, and best of all, the tables can be stored flat on a closet shelf. To lend a festive air to the informal setting, tin-can "Japanese" lanterns lighted with insect-repellent candles may be hung from nearby tree branches when dusk takes over.

There's nothing to making the tables. The particular design of the half-lapped legs permits them to be cut in duplicate by tacking both pieces together. The half-lap slots, of course, must be cut individually, unless you may be cutting a stack of right-hand or left-hand legs. Outdoor plywood, $\frac{1}{4}$ in. thick, is the best material to use, although not essential. Common fir plywood, well painted, will last a long time. Like the legs, the tops of the tables can be cut in quantity





and slotted at the same time. Perhaps, it would be best to make the parts for one table first, and then after a trial fit, use them as master patterns in laying out the others. As for decoration, designs may be jigsawed right in the legs as indicated in the squared drawing, or appropriate decals can be selected and used to add a decorative touch. A coat of varnish over the decals, as well as over any painted designs, will protect them.

Each lantern is formed from a 1 1/2-qt. tin can. Starting out as pictured in the details above, both ends of the can are removed and then seven serrations, 1 3/4 in.

2 1/2 in. deep, are made around one end. Then, cutting up from the opposite end, a V-shape opening is made for inserting a candle. After this, rows of 1/8-in. holes are made around the sides of the can, using a pointed tool such as an ice pick. The serrated end of the can is formed to a conical shape and a wire bail is provided for hanging. A wooden disk recessed in the center to hold a candle is inserted in the open end of the can and tacked in place to complete the lantern. Either painted designs or gaily colored decals can be used to decorate the lanterns. A coat of varnish or paint will protect the wooden disk. ★★★

Hot Water Frees Cleaning Patch Stuck in Barrel of Gun

A cleaning patch that has become stuck in the barrel of a rifle may be removed in most instances by soaking it with hot water poured down the barrel. One way of doing this, without causing an excessive amount of water to run down the outside of the barrel and possibly burn one of the hands, is by using a small funnel and a cloth. Place the funnel over the muzzle and wrap a cloth around both the funnel spout and the end

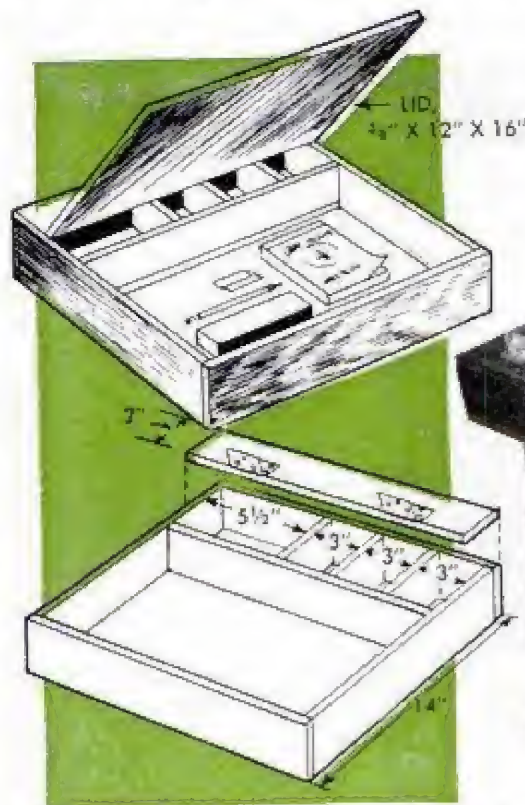
of the barrel. This not only will soak up most of the water that escapes but also will protect your hand. When the patch has been extricated, the barrel and the mechanism of the gun, needless to say, must then be dried and oiled thoroughly. After drying the bore with several more patches, use a soft cloth or, if available, compressed air to dry the gun mechanism.

H. Leeper, Canton, Ohio.

Child's Lap Desk Helps Teach Orderly Habits

This novel desk which is small enough to be held on a child's lap provides a handy container for drawing materials, school supplies and numerous other articles and treasured keepsakes. In addition, the desk helps to encourage neat, orderly care of personal possessions. Requiring only the simplest tools in its construction, the lap desk consists simply of a box containing built-in partitions and fitted with a hinged cover. The cover and bottom are cut from $\frac{3}{8}$ -in. plywood, while $\frac{1}{4}$ -in. plywood is used for the partitions. A 60-in. length of $\frac{3}{4}$ -in. stock, $3\frac{1}{2}$ in. wide, is cut into four pieces which make up the sides of the box.

Other supplies that will be needed are a pair of surface cabinet hinges, 1-in. brads, screws, glue, stain, shellac and wax. Use flatheaded screws driven in countersunk holes and cover the screwheads with wood putty. The partitions are assembled with brads and glue. Extra partitions may be added for bottles of ink and paints, as well as grooved wooden trays for pens, pencils and brushes. When assembled, smooth both the inside and outside surfaces of the box with sandpaper and apply stain in any color desired. Next, give the outside of the box a coat of shellac and, when dry, wax it to provide a smooth finish. — Mrs. H. T. Holmes, St. Clair Shores, Mich.



Badge Attached to Coat With Pencil Clip

When attending a convention or similar gathering where ribbon badges are worn, you can easily forestall the possibility of damaging your clothing as a result of having such a badge torn off accidentally. Simply fold the top edge of the ribbon over the breast pocket and secure it with the clip of a pen or pencil. This also is helpful when a ribbon is supplied without a pin or if the pin has been lost.

Reproduction of Craftsman Cover Used in Making Calendar

After obtaining the $10\frac{1}{4} \times 13\frac{3}{8}$ -in. color reproduction of the cover for the Craftsman section of the 50th Anniversary issue of *Popular Mechanics*, one reader used the picture in making an attractive calendar for his home. A $\frac{1}{2}$ -in. strip was trimmed from the top of the backing and $\frac{3}{4}$ -in.



strips removed from the sides. Two holes were punched near the top for the cord and a 1952 calendar pad glued near the bottom.

Arthur Trauffer, Council Bluffs, Iowa.

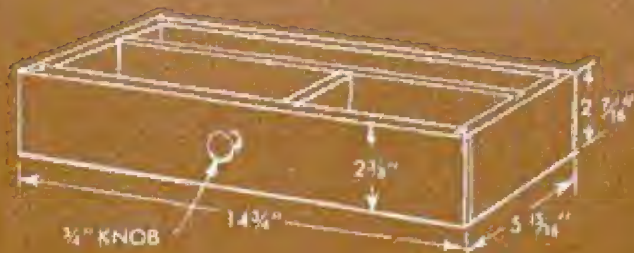
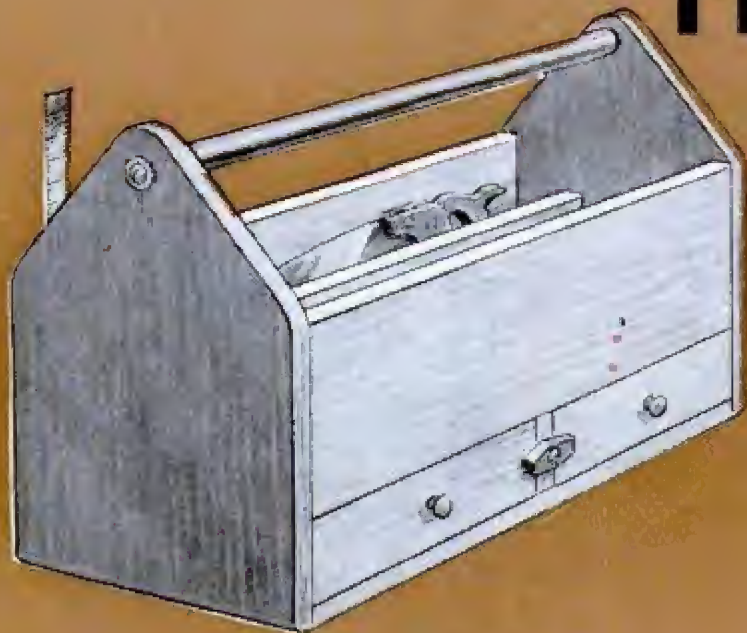
Lathe Dog Supports Round Work For Accurate Center Drilling



work from turning. The body of the dog holds the work in a vertical position for centering of the drill bit. Long rods of small diameter can be inserted through the hole in the drill-press table and held securely in position with the dog.

An ordinary lathe dog makes a handy drill-press vise for holding round, hexagon or square stock for center drilling. The tail of the dog drops into a slot in the drill-press table to prevent the

PLAN of the MONTH...



PARTITION ONE DRAWER FOR NAIL SETS, DRILLS AND BITS. LEAVE THE OTHER UNDIVIDED FOR WOOD CHISELS

OPEN TOOLBOX

Clear lumber

- 2 pcs.— $\frac{3}{4}$ " x $9\frac{1}{2}$ " x $13\frac{3}{8}$ "—Ends
- 1 pc.— $\frac{3}{4}$ " x $9\frac{1}{2}$ " x $30\frac{1}{2}$ "—Bottom
- 1 pc.— $\frac{3}{4}$ " x $8\frac{1}{2}$ " x $30\frac{1}{2}$ "—Back
- 1 pc.— $\frac{3}{4}$ " x 6 " x $30\frac{1}{2}$ "—Partition
- 1 pc.— $\frac{3}{4}$ " x 6 " x $30\frac{1}{2}$ "—Front
- 2 pcs.— $\frac{3}{4}$ " x $23\frac{1}{2}$ " x $14\frac{3}{4}$ "—Drawer fronts
- 1 pc.— $\frac{3}{4}$ " x 6 " x $2\frac{1}{2}$ "—Drawer divider
- 2 pcs.— $\frac{1}{2}$ " x $1-15/16$ " x $14\frac{1}{4}$ "—Drawer backs
- 4 pcs.— $\frac{1}{2}$ " x $2-7/16$ " x $5-7/16$ "—Drawer sides
- 2 pcs.— $\frac{1}{2}$ " x $5-3/16$ " x $14\frac{1}{4}$ "—Drawer bottoms
- 2 pcs.— $\frac{3}{4}$ " x $\frac{3}{4}$ " x $5\frac{1}{4}$ "—Glue blocks

Waterproof plywood

- 1 pc.— $\frac{1}{4}$ " x 6 " x $30\frac{1}{2}$ "—Bottom

Hardwood

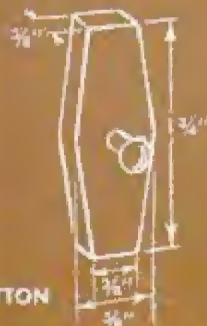
- 1 pc.— $\frac{3}{8}$ " x $\frac{5}{8}$ " x $1\frac{3}{4}$ "—Turn key
- 1— 1 " x $31\frac{1}{4}$ "—Dowel
- 2— $\frac{3}{4}$ "-dia. knobs



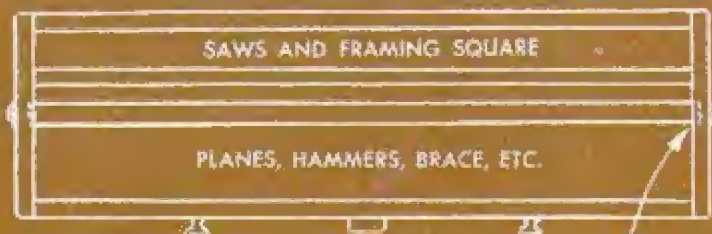
$\frac{1}{4}$ " x $\frac{1}{4}$ " TENON



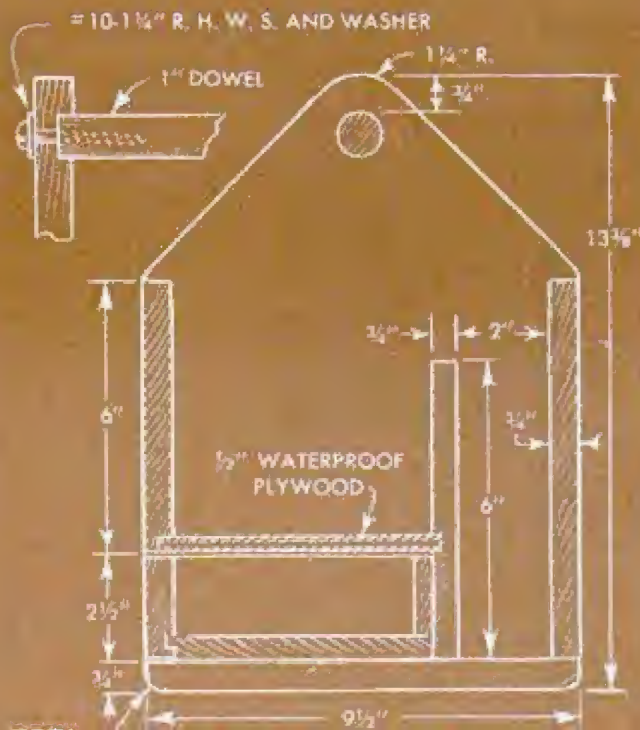
CENTER DRAWER GUIDE



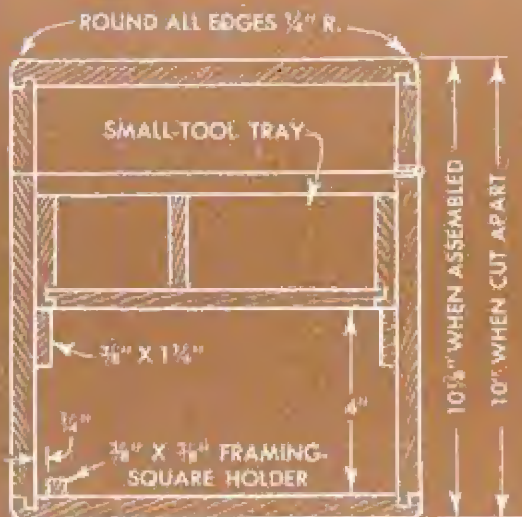
DRAWER TURN BUTTON



BORE HOLE $\frac{3}{8}$ " DEEP FOR 1" DOWEL HANDLE



.. Tool Boxes



CLOSED TOOLBOX

Clear lumber or waterproof plywood

- 2 pcs.— $\frac{1}{2}$ " x 9" x 32"—Top and bottom
- 2 pcs.— $\frac{1}{2}$ " x 9 $\frac{1}{2}$ " x 32"—Sides
- 2 pcs.— $\frac{1}{2}$ " x 8 $\frac{3}{4}$ " x 9 $\frac{1}{2}$ "—Ends
- 2 pcs.— $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " x 12"—Tool-tray side
- 1 pc.— $\frac{1}{2}$ " x 2" x 11 $\frac{3}{8}$ "—Tool-tray partition
- 1 pc.— $\frac{1}{4}$ " x 2" x 2 $\frac{3}{4}$ "—Tool-tray partition
- 1 pc.— $\frac{1}{2}$ " x 6 $\frac{1}{2}$ " x 11 $\frac{3}{8}$ "—Tool-tray bottom

Clear lumber

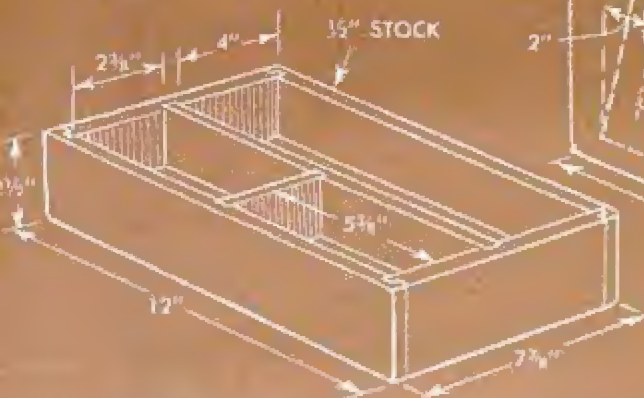
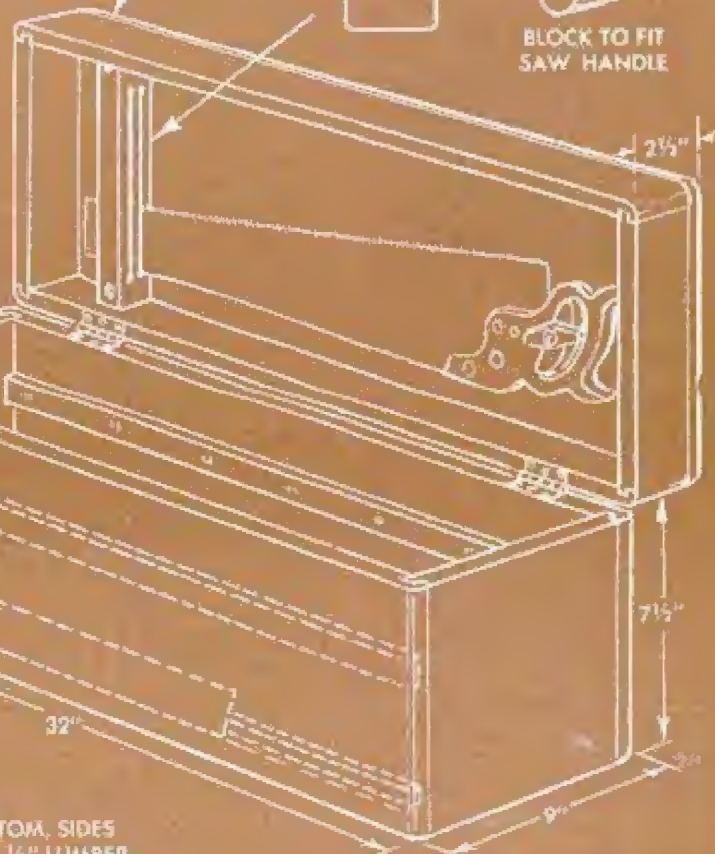
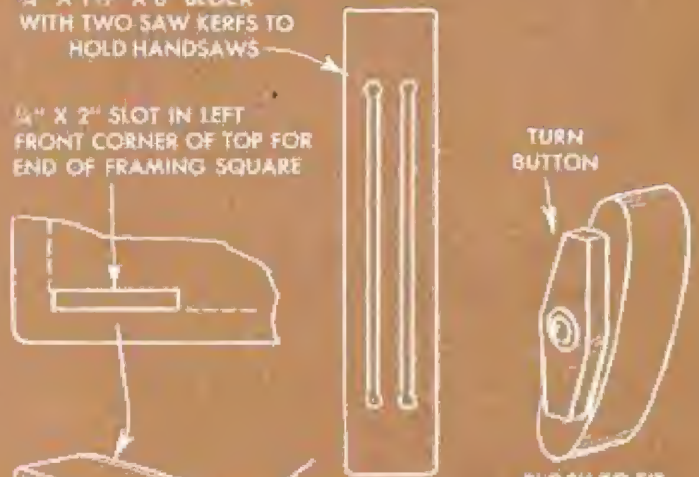
- 1 pc.— $\frac{3}{8}$ " x $1\frac{1}{4}$ " x 31"—Tool-tray rail
- 1 pc.— $\frac{3}{8}$ " x $1\frac{1}{4}$ " x 29"—Tool-tray rail
- 1 pc.— $\frac{3}{8}$ " x $\frac{3}{8}$ " x 31"—Framing square strip
- 1 pc.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 7"—Saw block
- 1 pc.— $\frac{3}{8}$ " x $\frac{5}{8}$ " x $1\frac{1}{4}$ "—Turn key
- 2 prs.—1" x $1\frac{1}{2}$ " butt hinges
- 1 suitcase handle with fittings
- 1 suitcase flush lock
- 2 suitcase bolts
- 8 suitcase corners, $1\frac{1}{4}$ " x $1\frac{1}{4}$ " x $1\frac{1}{4}$ "

$\frac{3}{4}$ " X $1\frac{1}{2}$ " X 8" BLOCK WITH TWO SAW KERFS TO HOLD HANDSAWS

$\frac{1}{4}$ " X 2" SLOT IN LEFT FRONT CORNER OF TOP FOR END OF FRAMING SQUARE

TURN BUTTON

BLOCK TO FIT SAW HANDLE



REMOVABLE SMALL-TOOL TRAY

TOP, BOTTOM, SIDES AND ENDS $\frac{1}{2}$ " LUMBER OR WATERPROOF PLYWOOD

Compass Used to Draw Parallel Lines Saves Repeated Measuring



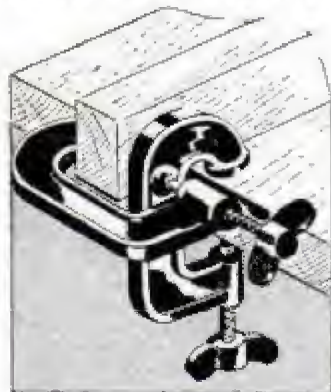
Using a ruler and a compass, it's a simple matter to scribe a series of straight, parallel lines without first measuring for each line. Adjust the compass to the desired spacing and mark the initial line on the work by running a pencil along the ruler. Next, reverse the position of the compass and, without moving the ruler, mark the second line by holding the point of the compass against the edge of the ruler. This provides two parallel lines that are spaced uniformly. To rule additional lines of the same spacing, align the ruler on the last line drawn and repeat the operation as described. If the compass is of the friction-joint type as pictured in the illustration, take care that you do not press down hard enough to cause the legs of the compass to spread accidentally.

Nailheads Protected When Set By Wooden Thread Spool

Furniture nails having decorative or large enameled heads more often than not prove difficult to set without damaging the heads with the final blows of the hammer. In order to keep from marring the nails, one amateur upholsterer holds a wooden

thread spool vertically against the nailhead while he finishes driving the nail. The wood cushions the blows from the hammer, leaving the nailhead unmarred, while the hole in the spool serves to center it on the rounded head of the nail.

Work Held During Edge Planing With Pair of C-Clamps



Lacking a bench vise with which to hold boards for edge planing, one craftsman used two C-clamps to improvise a vise. As in the drawing, he locked one of the clamps in a vertical position against the side of the work with the

second clamp. He then tightened the vertical clamp to the edge of the bench top. The clamp used to fasten the work to the bench must be small enough so that its top edge does not interfere with the plane.

Removing Rust Stains on Sink

Rust stains on porcelain-enameled sinks can be removed with a dilute solution of hydrochloric (muriatic) acid applied with a cloth swab. Rub the solution lightly onto the stained surface, allow it to remain from three to five minutes, then wash the surface with a soda-water solution to remove the acid residue. *Caution: Do not permit any of the acid solution to come in contact with the skin.*

Battery Clip Supports Brushes In Cleaning-Fluid Can

In order to prevent the bristles of small brushes from becoming bent over and twisted when left in a can of cleaning fluid, suspend the brushes from a two-way battery clip of the type shown. A length of stiff wire, inserted through the center of the clip, rests on the edges of the can. If a two-way clip is not available, improvise one simply by screwing two regular clips together and drilling a hole for the wire.





SMALL BOATS Go Inboard

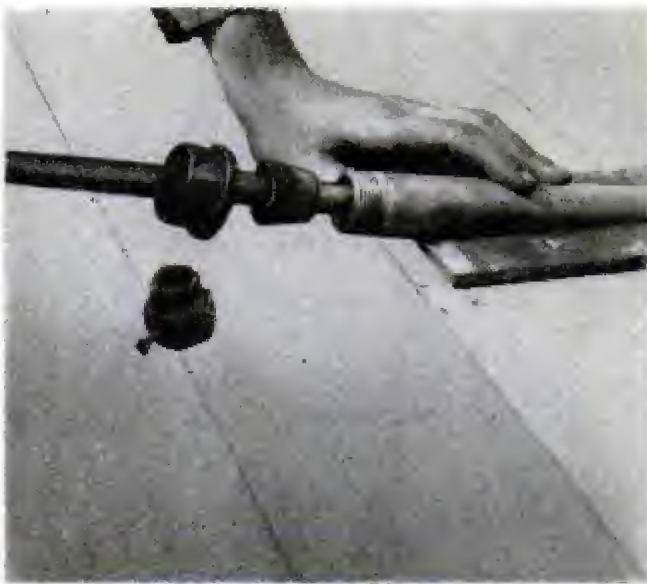
By *Elon Jessup*

ALL THE FUN of piloting an expensive inboard boat can be yours by powering your skiff, rowboat or outboard with an air-cooled engine of the single-cylinder utility type. These efficient little engines are self-contained units and require no conversion for inboard mounting in any open boat under 16 ft. in length, and their availability in sizes ranging from $\frac{1}{2}$ hp. up makes them suitable for inboard mounting in hulls down to 7 ft. in length. Several of the larger engines are supplied with special marine equipment, including a clutch and reverse gear. A 2 to 3-hp. engine will handle a 12 or 14-ft. boat at good cruising speeds in quiet water.

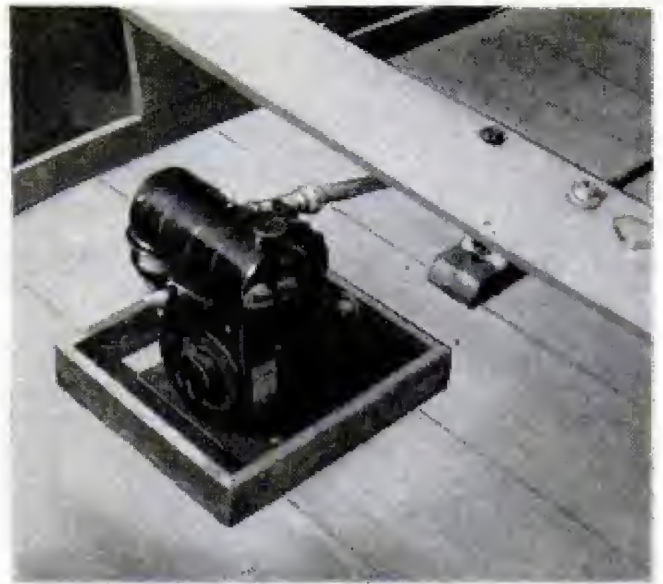
Installation of the engine in the average open boat usually is quite simple. There are no fuel or water lines to plan and install and no battery to be mounted, therefore all that is necessary is to bolt the engine to suitable bearing blocks attached to the bottom of the boat. A typical installation in a small flat-bottom skiff is shown in the lower details on the following page. Before the engine is placed, several points should be considered. An air-cooled engine should

not be installed under a deck or behind a bulkhead, as it will quickly overheat. Neither should it be placed in a well or compartment. Many users install the engine at the center of the boat, or slightly forward of midships, depending on the location of the seats, and operate it without any cover. The only disadvantage in this type of installation is that the unprotected engine may be drowned out during a sudden rain squall, or stop at a critical moment should water be shipped in rough weather. A recommended type of protective covering is shown on the following page. Screened openings at the front and back permit free circulation of air and a hinged cover over the top protects the engine from rain and driven spray, while permitting easy access to the starting cord. The covering, or hood, which is designed to lift off quickly when making repairs or adjustments, is attached with small hooks to a frame built around the engine.

Nearly all small engines of the air-cooled type will operate satisfactorily when tilted at an angle of 10 deg. A greater degree of tilt usually is not advisable. For this reason it will be necessary to connect the engine to the inboard end of the propeller shaft



In some installations a rigid shaft log will serve the purpose, but usually the adjustable type is best

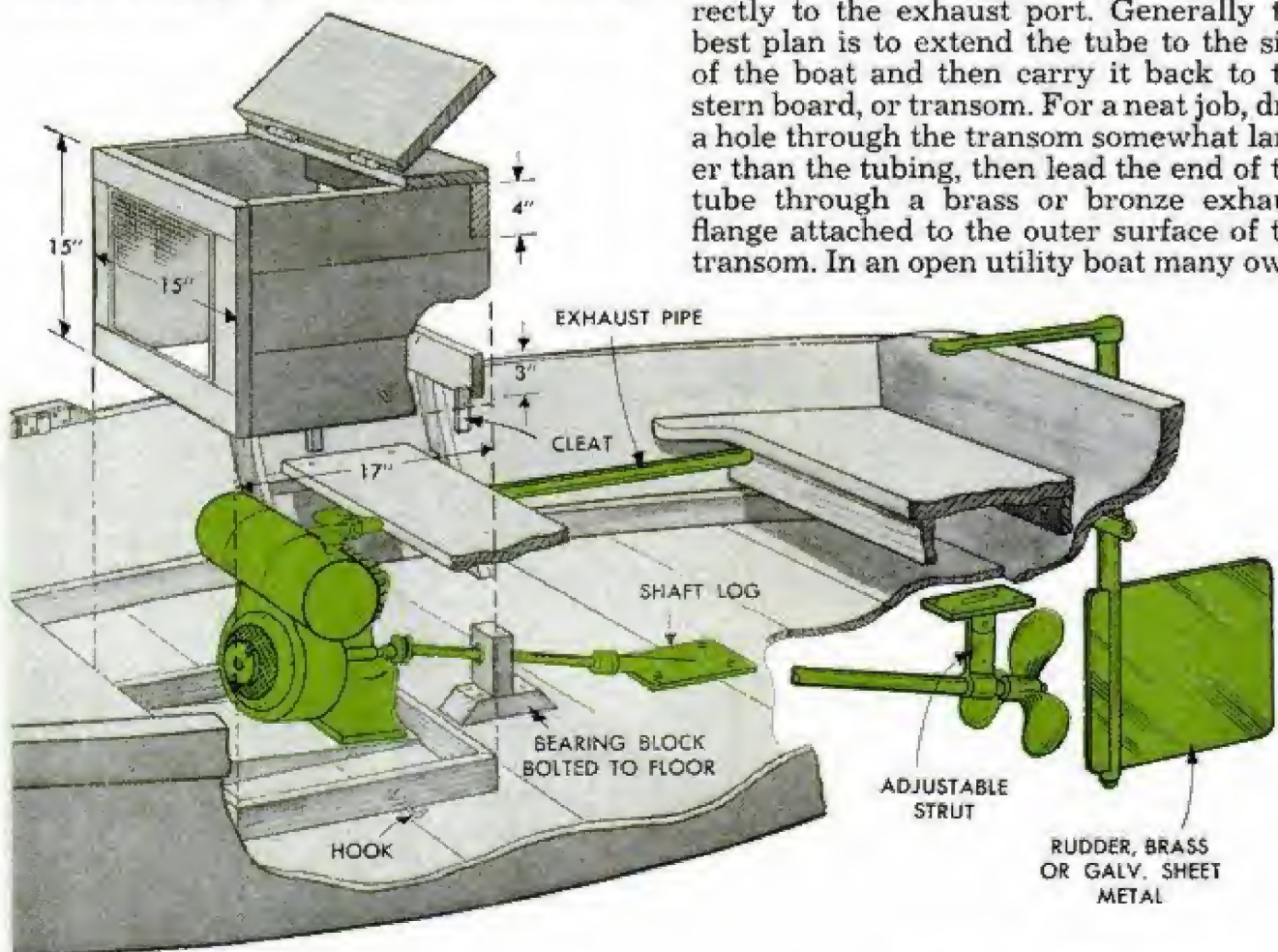


In many instances the engine can be bolted directly to the floor of boat without using tapered timbers

with a marine-type flexible coupling. On most small boats it is advisable to use a self-aligning shaft log and adjustable propeller strut. Some small boat hulls will permit fitting a skeg which can be drilled lengthwise for the propeller shaft. When mounting the shaft in a skeg, some builders simply fit the outer end with a nonscoring, or cutless, bearing. However, it usually is better to carry the underwater end of the shaft in a flange-mounted stuffing box. When obtainable, it is advisable to use a monel-metal propeller shaft. The cutaway

view below shows the shaft mounted in a rigid shaft log and fitted with an improvised inboard bearing. In flat-bottom boats this type of installation generally proves satisfactory, although in some cases an inboard strut will provide a steadier mounting for the shaft.

In a pleasure boat, some means of leading the exhaust to the side or stern of the boat is desirable. Usually a length of gas-tight flexible tubing will serve the purpose. When tubing is used, the regular muffler is removed and the tubing connected directly to the exhaust port. Generally the best plan is to extend the tube to the side of the boat and then carry it back to the stern board, or transom. For a neat job, drill a hole through the transom somewhat larger than the tubing, then lead the end of the tube through a brass or bronze exhaust flange attached to the outer surface of the transom. In an open utility boat many own-





Top of the engine cover or hood should be hinged for easy access to starting cord. Note the open ends



This hood is screened on all four sides, permitting ample circulation of air to the engine cooling fan

ers either omit the exhaust line entirely or install one made from ordinary pipe. In any case be sure that the exhaust line does not touch the wood at any point along its length. Wrap the pipe with several layers of sheet asbestos at the point where it passes through the transom.

A rudder of the tiller-controlled type, shown in the detail on the preceding page, is available as a unit from marine-supply dealers. Ordinarily the rudder size should

be about 10 x 12 in. and it can be installed on the outside of the transom, or inboard, as desired. Rope-and-drum steering units often are installed in place of the tiller. Two-bladed bronze propellers of the general-purpose type are quite often used in inboard installations. For small engines, the propeller size can range from 6 to 10 in. depending on the power of the engine and the size and type of the boat. Always carry a pair of oars for emergencies. ★ ★ ★

Oil Applied to Shingle Roof With Garden Sprayer

Applied easily with a garden sprayer of the type that is carried by means of a strap slung over the shoulder, a mixture consisting of 2 parts each of kerosene and crankcase oil, and 1 part creosote provides one homeowner with a very satisfactory, durable dressing for shingle roofs. First, the oils are poured into a 5-gal. can and mixed together by shaking the can. The dressing is then strained through a fine-mesh cloth when filling the sprayer tank in order to remove any particles or sediment that might possibly clog the spray nozzle. The oil is applied with pressure sufficient to drive it well into the joints between the shingles as well as over the butt ends of the

shingles where the greatest weathering occurs. Beginning at the ridge and backing away from the work while spraying the roof above, care should be taken to direct the spray in such a way that there will be little possibility of spattering the sides of the building. Naturally, the job should not be attempted whenever there are strong breezes blowing. Since oil causes the rubber gaskets and hose to deteriorate, it is a good idea after the job is finished to rinse the parts with gasoline and then wash them in water containing a strong detergent or soap. When finished, rinse the parts again—this time using clear water.

Clinton R. Hull, Costa Mesa, Calif.



Renewing Points of Wax Crayons

With a little supervision, children will have fun reshaping and repointing their worn and bent wax crayons. A pan of warm water and another one of cold are all that is needed to do the job. First, place the crayons in the pan of warm water. This will soften them and loosen the paper wrappers for easy removal. It is then a simple matter to straighten the crayons and point both ends or taper them as desired. When finished, simply drop the crayons into the pan of cold water to harden them.

Herbs Cured in Paper Bag



To prevent loss of leaves when curing herbs, spread the fresh clippings on a newspaper until the stems shrink and the leaves are partially dry. Then tie the clippings in bunches, invert each bunch in a paper bag and tie

the mouth of the bag securely about the bunched stems. Store the bags in a dry place until the herbs are needed. Then shake the bag lightly before untying to loosen the dried leaves from the stems.

John J. Rea, Urbana, Ill.

Modelmaker's Magnifying Glass

Mounted on the shade of a gooseneck lamp, a pocket-size magnifying glass is of considerable help to modelmakers when

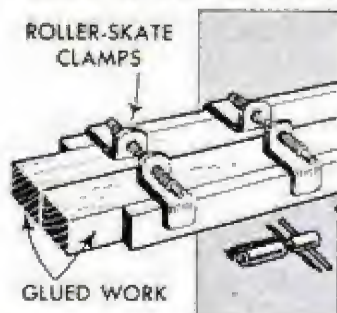


assembling small parts or carving intricate designs. The glass is clamped to the bead of the shade with a double-end battery clip so that the lens is slightly below the shade. The lamp brightly illu-

minates the work, and as the glass does not have to be held by the hobbyist, both hands are left free for handling the work. The glass is brought to almost any desired position by adjusting the gooseneck.

Joel Miles, Denver, Colo.

Clamps From Roller Skates Used to Hold Glued Work



Toe clamps of the type used on roller skates will prove useful in many instances where pressure must be applied to glued joints. It usually is possible to remove them

from the skates simply by unscrewing the threaded rods all the way, after which they are reassembled with the clamp jaws. Strips of wood should be placed under the jaws to prevent them from marring the work. The clamps are easily replaced on the skates.—Walter Burton, Akron, Ohio.



Many fishermen regard tent caterpillars as the best live bait for pan fish. Look for them in low-growing shrubs and small trees along fence rows

Where To Find NATURAL BAIT

By Russ Jenkins

ALTHOUGH NATURAL baits usually are plentiful in and near lakes, ponds and small streams during the fishing season, the trick in catching them is in knowing where to look. Lively insects, such as grasshoppers and crickets, are quite easily spotted in sunny, open areas along the stream or lake shore while small green frogs suitable for bait are fairly easy to locate anywhere along a stream bank. However, many of the best live baits will require a more diligent search. Don't waste time digging for earthworms and grubs in sandy or clay soils. If you're in the woods, search for them under rotted logs, around old stumps and weathered sawdust piles. Clams, and also hellgrammites, will be found in the stream bed, the hellgrammites under stones and submerged logs and the clams on the muddy bottom of sluggish streams near the shore. Crayfish are caught easily with a minnow net along the stream bank. Minnows can be taken with drop nets and seines, but most fishermen rely on a trap made especially for the purpose. Look for tent caterpillars in low-growing shrubs and also in walnut trees. When the "tents," which are observed easily from a distance, are located, cut off the limb close to the tent and you have a supply of live bait for a day's fishing. Nearly all live baits will remain alive and healthy for several days if kept in containers with moist earth, rotted wood and other materials which approximate closely the conditions of their natural habitat.



WORM

Earthworms, or angleworms, will be taken by nearly all small game fish. Dig for them under rotted logs, around old stumps and under leaf mold



GRUB

In and under old rotted logs are the places to find grubs if you're in the woods. They also will be found around edges of weathered sawdust piles



FROG

Catching a green frog is a neat trick at any time but it can be done if you move quickly. Fishermen catch them with a landing net along streams



CRAYFISH

Crayfish can be caught with a minnow seine along banks of sluggish streams where water is shallow. Move stones and sunken logs to dislodge them



MINNOW

Minnows are easily taken with a net or seine, but most fishermen rely on a trap made especially for the purpose. Set trap in shallow water near shore



CRICKET

Few small game fish can resist a lively cricket when the insect is properly hooked and tossed onto the surface of a still pool of clear water



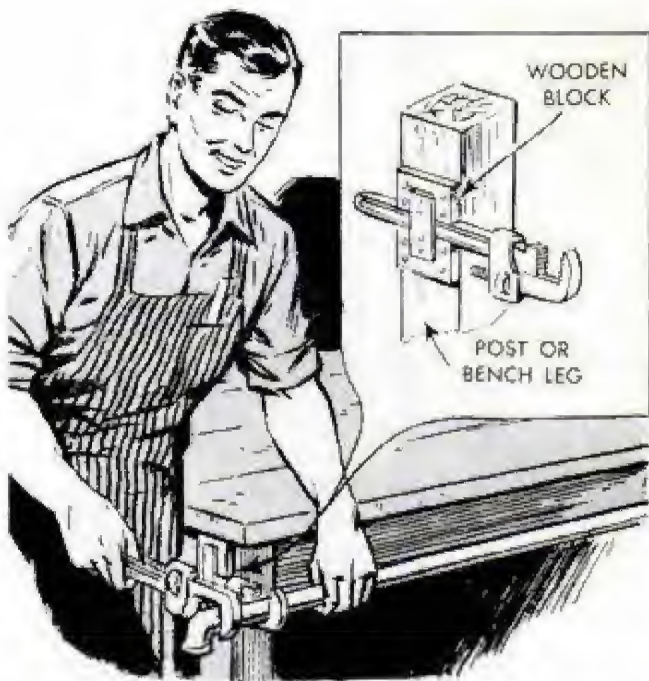
CLAM

Clams are located easily on the bottom in 3 to 5 ft. of water. When cut into strips, the flesh of the clam is an excellent bait for most game fish



GRASSHOPPER

A day's bait supply of 'hoppers can be taken in a few minutes with a piece of mosquito netting loosely attached to a wire frame having a handle



Improved Pipe Vice

Rather than buy a pipe vise for use on a simple plumbing job that required cutting and threading pipe, one home craftsman improvised a vise from a pipe wrench. He fitted the wrench handle into a 3-piece bracket which was screwed to a wooden post in the basement. The bracket blocks should be of hardwood and must be spaced so that when the wrench handle is inserted, it will be held tightly. Of course, the pipe-wrench vise also may be mounted on a bench or table leg as shown in the illustration.—Harry N. Pederson, Chicago.

Leather Sleeve on Bridle Reins Speeds Hitching Horse to Post



You can quickly hitch a riding horse to any nearby post if the reins have been fitted with a leather sleeve, or loop, which is used to draw them tightly around the post. The loop is a narrow piece of leather wrapped around

the reins and riveted loosely enough so it will slide easily. To keep the loop from slipping off the reins, the free ends of the reins are joined together with a buckle or by folding them double and riveting them together.

☐ To prevent the ends of lamp cords from becoming frayed, simply dip them in shellac and let dry before connecting the wires to the plug or socket.

Oilcan Used Without Removing Cap

More often than not, the plastic cap on a small can of household oil eventually becomes lost. After having this happen several times, I found a way of preventing it. When a new can of oil is purchased, I first back off the cap about 1½ turns and drill a tiny hole in the side near the tip. This permits the can to be used without removing the cap completely and, since the hole in the cap is below the end of the spout, screwing the cap all the way



down seals the can effectively. In addition to the advantage of not having to remove the cap, the partially removed cap permits a measured amount of oil to be applied.

Ken Murray, Colon, Mich.

Elbows in Drain Line Provided By Chipping Ends of Clay Tile

When installing drain tile around foundations, one builder chips the ends of two clay tiles at a 45-deg. angle in order to form a right-angle elbow. First, the end of each tile is marked at a 45-deg. angle as pictured. Then the waste is broken away in small pieces with an ordinary adjustable wrench having jaws set to an opening slightly greater than the tile thickness. After the tile are laid, the right-angle joint is covered with a strip of roll roofing.

Peter G. Gordon, Lansing, Ont., Can.



BRACING

Saves Old Trees

By Raymond Schuessler

BEFORE you cut down the venerable shade tree that's showing signs of old age, take time to examine it closely. Cabling and rod bracing may save it for many more years of usefulness by providing mechanical support for weakened crotches and large, spreading branches.

Tight V-crotches are a frequent source of trouble in both young and old trees which grow with multiple, or divided, trunks. Major limbs that begin growth very nearly parallel to each other often develop a seam, or joint, of nonconnecting tissue at the division point. This results from the squeezing and crushing of the cambium layer and bark as growth progresses. Eventually the affected tissues die, leaving an open seam. When the limbs become loaded with ice, or when the foliage is thoroughly wet down by a heavy rainstorm, the joint may break and cause irreparable damage to the tree.

A second ranking source of trouble in older trees is a decayed or damaged trunk caused by a fungus attack or partially healed wounds. Sometimes trunks and large limbs will be split by the twisting stresses of high winds or sleet storms. Such damage should be repaired immediately or the tree will be lost.

The two general methods of tree bracing are cabling and rod bracing. Although each tree presents an individual problem, the two methods have several common applications. Where trees stand in close proximity, inter-tree cabling combined with rodding, Fig. 1, is frequently used to stabilize younger trees and promote proper top formation. In older trees the methods are sometimes combined to distribute stresses which might cause damage to the individual trees, especially in open, windswept locations on large lawns or estates.

Utilizing the same principle, inter-branch



cabling of several types is used to support the tops of large individual trees. Typical applications are shown in Fig. 2. The cables are installed high in the branches to equalize the load on structurally weak crotches. As a rule, the most efficient for general use is the triangular system, Fig. 2. When the cables are installed care must be taken to locate them so that they do not touch other branches or the trunk of the tree as damage may result.

The location of the cables in relation to the length of the branches depends to some extent on the structure of the tree, but it's

Where trees of the same age are grouped closely together, inter-tree cabling frequently is used to stabilize growth and aid top formation. Large, individual trees are often guyed with cables, as in left-hand detail



a safe rule to place the screw eyes, or lags, about $\frac{2}{3}$ the distance from the crotch to the end of the limb. Holes for the screw eyes should be drilled so when the eyes are installed the parts will be in a straight line. Otherwise the screw eyes will be bent when subjected to strain. After measuring the distance between the screw eyes to determine the length of each cable, it is cut to length and eye-spliced as in Fig. 4, A, B, C and D. For average spans, $\frac{1}{4}$ -in. cable is suitable for supporting limbs up to 6 in. in dia. For larger limbs, use $\frac{5}{16}$ or $\frac{3}{8}$ -in. cable.

After installation, the cables should be under sufficient tension to hold them taut when the limbs are swayed by wind. To accomplish this, the limbs are roped to the tree trunk and raised somewhat above their normal position before cabling. In some cases this will require the aid of a tackle block.

Fig. 3 illustrates three methods of rod bracing in common use. To avoid weakening the limbs, the single-bolt method is the most widely used as it requires drilling only one hole in each of the limbs affected. The rod used is continuously threaded with a square thread similar to a lag screw. Usually it is cadmium-plated and comes in sizes ranging from $\frac{5}{8}$ to 1 in. in dia. Ordinarily

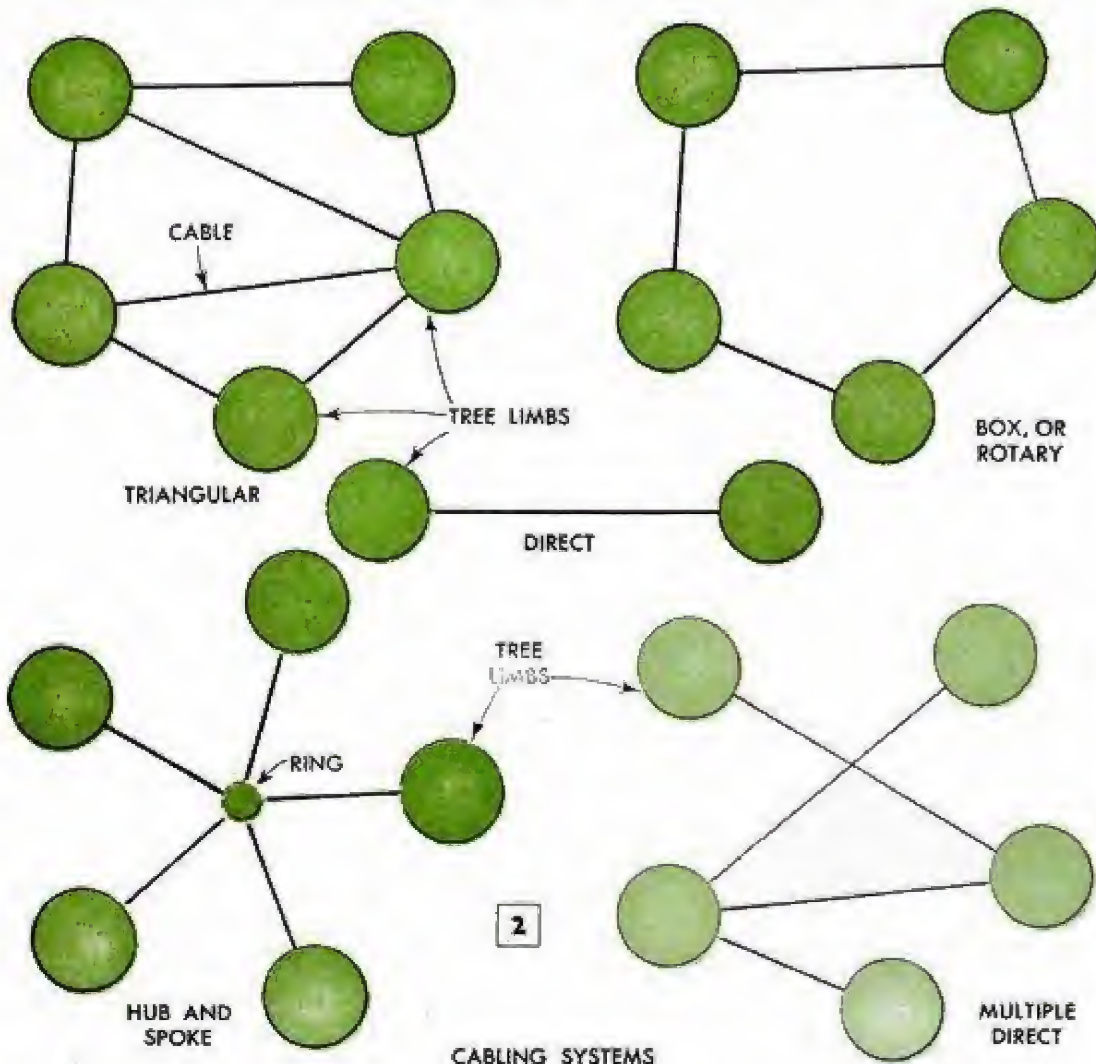
a hole slightly smaller than the diameter of the rod is drilled through both limbs at a point ranging from 18 to 36 in. above the crotch and the rod is turned in until one end projects an inch or so. Then, it is cut off to the required length and the ends coated with a special tree-wound dressing.

In some cases where the limbs are exceptionally large, it will be necessary to countersink diamond-shaped washers, or plates, over both ends of the rod and draw tight with nuts as in the lower left-hand detail in Fig. 5. In making the countersinks use a sharp chisel to produce a clean wound that will heal quickly. Fill the countersinks with tree-wound dressing.

Split trunks and large limbs are sometimes salvaged by use of lip and cross bolts installed across the break as in the upper left-hand details in Fig. 5. Large hollow trunks are frequently braced in this manner before being filled with tree cement. In order to be fully effective, rods used without nuts and washers should turn into at least 4 in. of sound wood in small trees and 6 in. of wood in larger trees. It's a good idea to coat the rods with wound dressing before turning them into place.

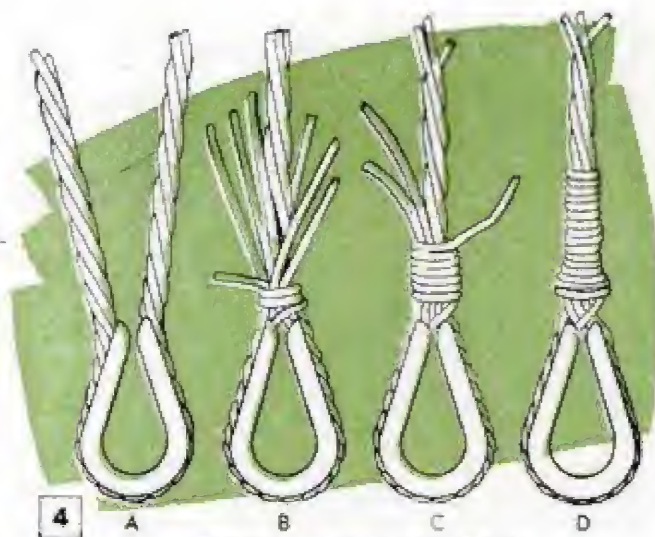
In some rare instances it is desirable to bolt two limbs tightly together, or a few

Details below show common methods of cabling and rodding large limbs within the treetop to support a spreading top and prevent crotch breakage. This type of cabling also prevents damage during high winds



inches apart, as in the upper right-hand details in Fig. 5. Usually this is done to preserve for a time the form of an old tree. In younger trees one of the interfering limbs should be removed. The limbs should never be forced together and bolted. Only when they are touching at some point is it permissible to insert the bolt without a spacer. In some cases they are separated and bolted together with a spacer between as in the center detail.

Large limbs that rub together during windstorms can be separated by means of the slide arrangement shown in the lower right-hand detail, Fig. 5. A strip or block of hardwood is bolted to one of the limbs, preferably the lower one, and a long U-bolt made from smooth steel rod is fitted into two holes drilled in the upper limb as shown. Thread both ends of the rod before bending, the thread length being slightly greater than the diameter of each limb. After the rod has been bent to the U-shape, run nuts down to the limit of the threads on both ends and place washers over the nuts. Then insert the bolt in the holes and turn nuts onto the projecting ends as shown. It is of the utmost importance to treat all tree wounds immediately to prevent the entrance of insects and disease-producing

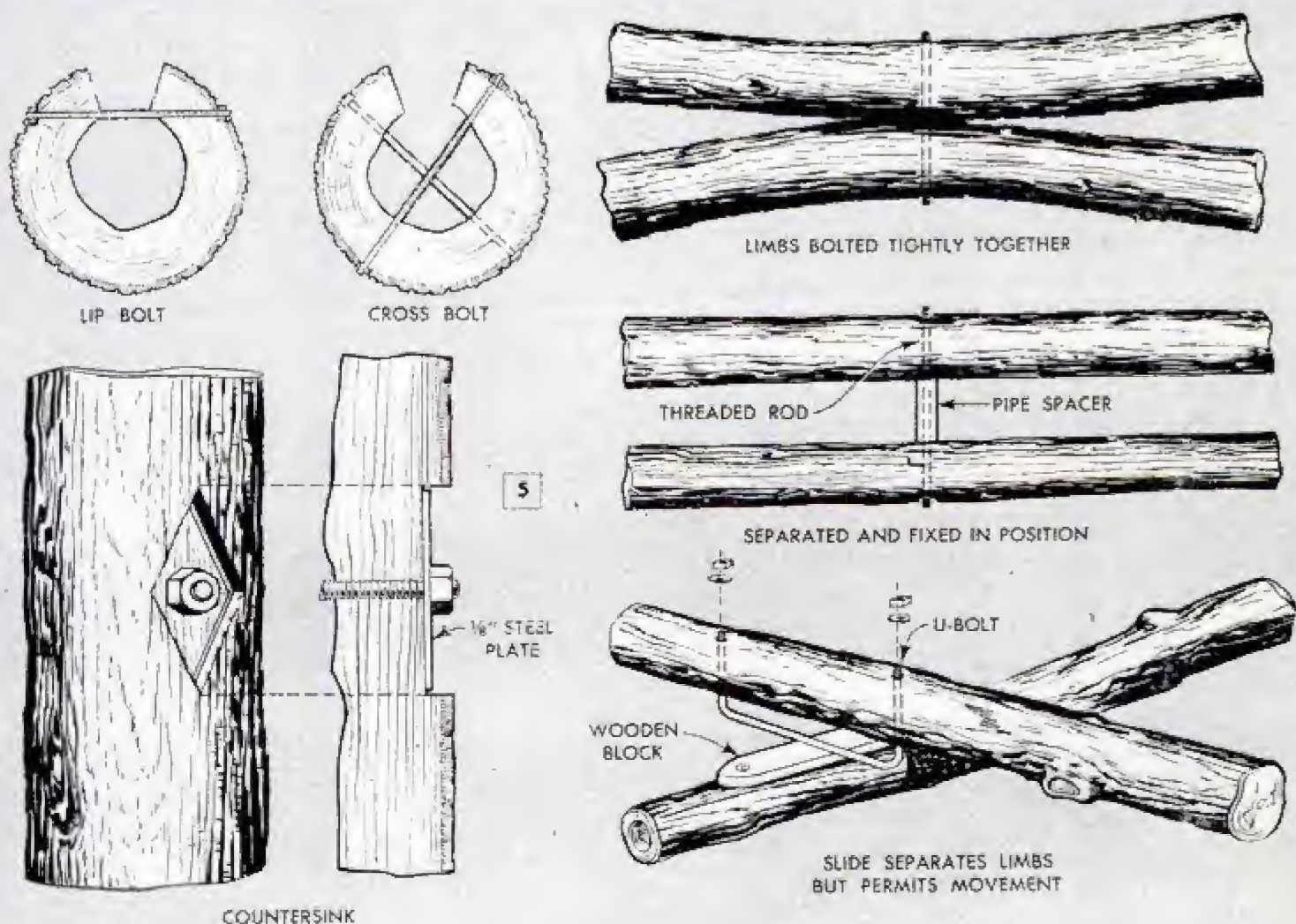


4 STEPS IN MAKING EYE SPLICE IN 7-WIRE STRAND

Cables anchored to limbs will require an eye splice at each end. Details show how to make a 7-wire splice

organisms. Wounds made by cutting through the bark into the cambium layer must be sealed at once with a special dressing made for the purpose, or with a dressing made by mixing dry bordeaux with raw linseed oil to make a paste sufficiently heavy to stay in place when spread with a putty knife or small trowel. Destroy the unused portion of this mixture. ★ ★ ★

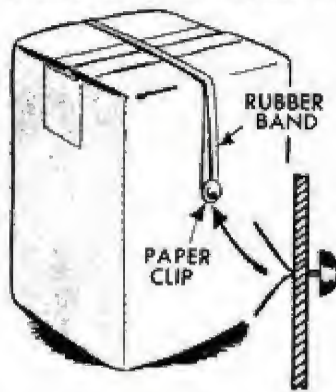
In many instances, split limbs and hollow trunks of older trees are reinforced by lip and cross-bolting as detailed below. Special threaded rods are used for this type of bracing on both old and young trees



5

COUNTERSINK

Carton Fastener Saves Time

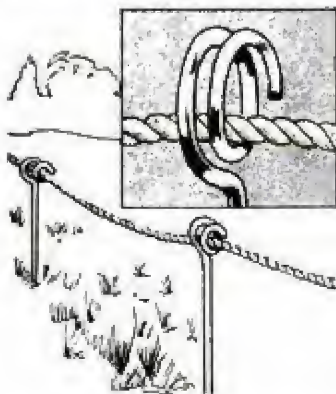


If a cardboard carton in which various items are stored must be opened from time to time, this simple means of holding down the cover flaps with a rubber band will save you considerable bother. A button-type

paper fastener is inserted in each of two opposite sides of the box, after which the ends of a large rubber band are passed over the top of the carton and looped around them. To open the carton, the band is lifted and swung over one side.

Guard Ropes Erected Quickly On Stakes Coiled at One End

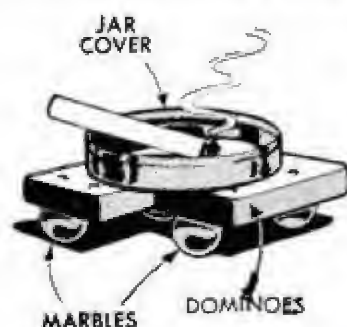
Supported by steel stakes coiled at one end approximately $2\frac{1}{2}$ turns as shown, guard ropes for an athletic field or parking area can be erected or taken down in a matter of minutes.



After the area to be used has been marked off, the stakes are pushed into the ground and the rope is twisted into the coils. — G. E. Hendrickson, Argyle, Wis.

Ash Tray for Game Room

Symbolic of a card or game room, this novel ash tray is made from a couple of dominoes, four glass marbles and a jar cover. After cementing the dominoes together, the marbles are attached to serve as feet for the tray. It is a good idea to sand each marble and also indent the surface of each domino where the marbles are to be cemented to it. This may be done by holding the marble in position on the domino, placing a small block of wood over it and then striking with a hammer. The jar cover should then be sanded where it is to be cemented to the dominoes. Any good household cement will do. — Frank Shore, New York City.



BOOMERANG TABLE

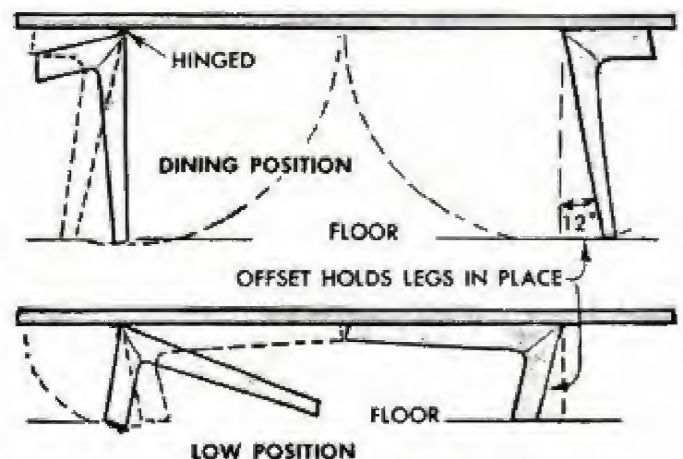
By Tom Riley

DUBBED "BOOMERANG" because of the characteristically shaped legs, this unique piece of functional furniture is the practical answer to the space problem in today's combination living-dining room. It serves as a swank cocktail table and a spacious dining table all in one. The particular shape of the hinged legs provides extreme rigidity when the table is raised to the dining position, and due to their being offset 12 deg., no hardware is required to lock the legs in place.

Its utter simplicity of construction stems from the fact that the ready-made top is a flush-type door. A $1\frac{3}{8}$ or $1\frac{1}{4}$ -in. interior, or hollow-core, door is recommended and all that the top requires is a $\frac{1}{4}$ -in. facing strip glued to the edges. The drawing on the opposite page shows how this is mitered at the corners, and also shows how the twin leg units are put together, each individual leg being cut as indicated from a 36-in. length of $1\frac{3}{4}$ -in. stock. Plywood "stretchers," $\frac{3}{4}$ in. thick, fit into stopped rabbets cut in the inner corners of the legs to tie the latter together. Hinging the leg assemblies to the underside of the door completes the table. Center these under the top and allow about $\frac{1}{8}$ -in. clearance between the legs when the table is in the low position. Furniture glides on ends of legs are optional.

A simple way to obtain a bleached finish with either birch or oak is to give the table a coat of white resin sealer, then sand to the tone desired and follow with two coats of clear resin sealer, varnish or wax.

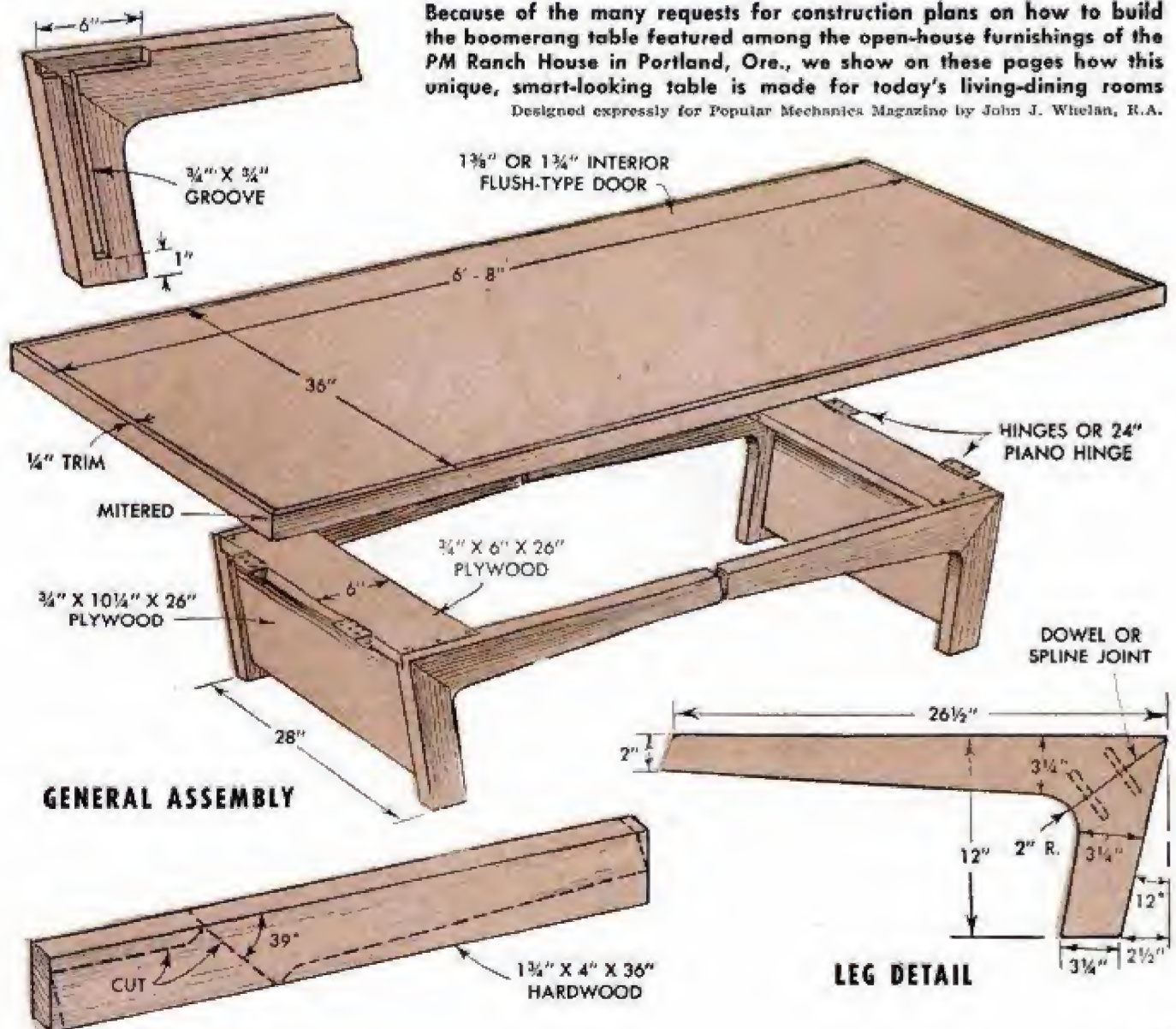
These two drawings show how the boomerang-shaped legs swing to convert the table from a low cocktail table to a roomy dining table in a matter of seconds



POPULAR MECHANICS



Because of the many requests for construction plans on how to build the boomerang table featured among the open-house furnishings of the PM Ranch House in Portland, Ore., we show on these pages how this unique, smart-looking table is made for today's living-dining rooms
 Designed expressly for Popular Mechanics Magazine by John J. Whelan, R.A.

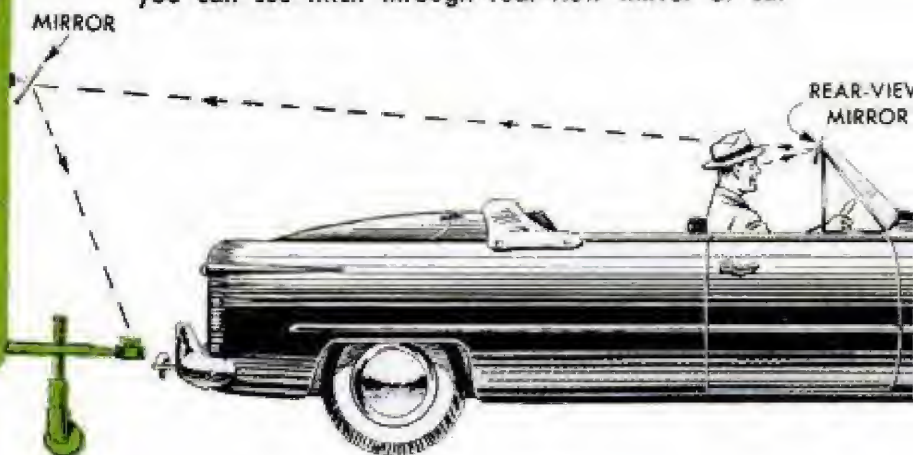


GENERAL ASSEMBLY

LEG DETAIL

10 Tips for Trailerites

You can back up the car to engage a trailer hitch without help if a mirror is fastened to the front of the trailer directly over the hitch. In this way you can see hitch through rear-view mirror of car



PLASTIC BOWL COVER



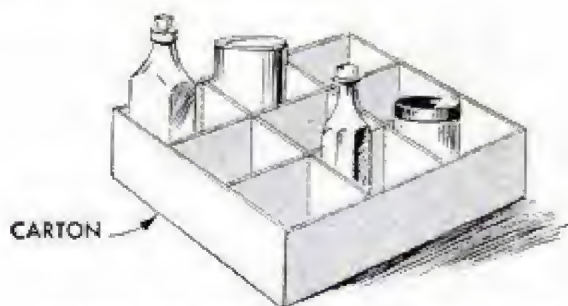
Desert sand and road dust are kept from filtering through trailer chimney by slipping a plastic bowl cover over the chimney cap



Ceiling hammock made from scrap of netting holds odds and ends, above. Netting is tied to screw eyes. Below, sectioned carton keeps jars and bottles from tipping and spilling

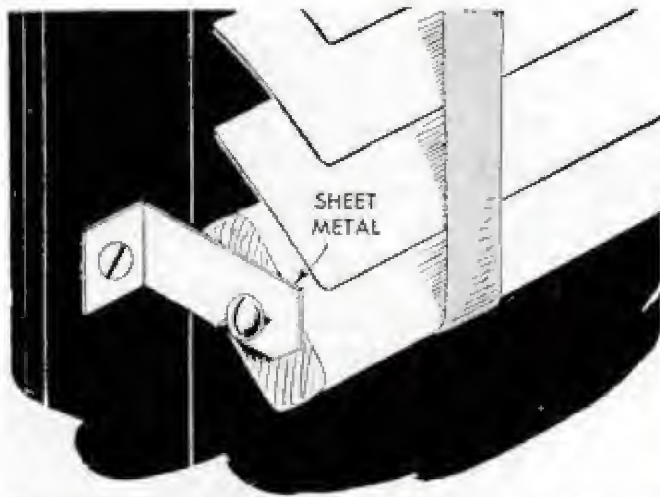


Trailer check list will save trouble caused by forgetting to take care of necessary preparations before driving away. Tack list to inside of trailer door

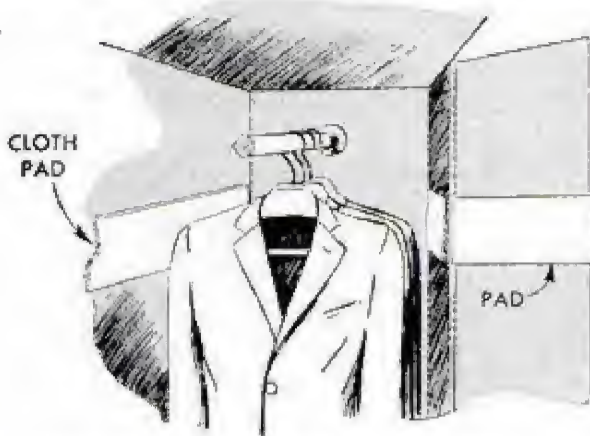


Trousers and ties won't fall to floor while traveling if trousers are clipped to hangers with spring-type clothespins and ties are wrapped around hanger, as shown below

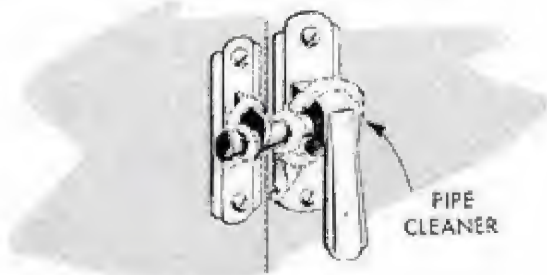




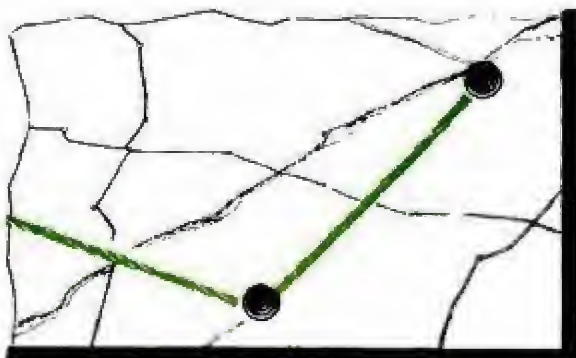
To keep a blind from rattling, fasten sheet-metal brackets to window frame and drive screws in ends of lower blind rail. Screws engage notches in brackets



If garments stored in trailer closet rub against walls and become worn at shoulders, tack cloth pads to walls and door of the closet, as above. Make pads from scraps of fabric or use an ironing-board cover

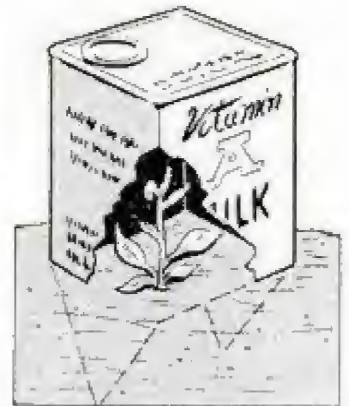


Cupboard latch that slips open can be secured by wrapping with pipe cleaner, above. Colored yarns strung between thumbtacks, below, decorate map and also show extent of travels at a glance



Milk Cartons Protect Plants

Young plants can be protected from frost by covering the tender shoots with jackets cut from quart milk cartons. Cut a wedge-shaped section from opposite sides at the center of the empty container, thus leaving a pair of prongs extending from each jacket. The prongs are pressed into the ground to anchor the jackets in place, as indicated by the dotted lines in the drawing. It's a good idea to start washing out and saving milk cartons a month or two before spring planting and cutting out the jackets whenever you have time. In that way, you will be ready with individual coverings for each plant when late-spring frosts are predicted.



George Kapitan, Bronx, N. Y.

Salt Shaker From Beverage Bottle

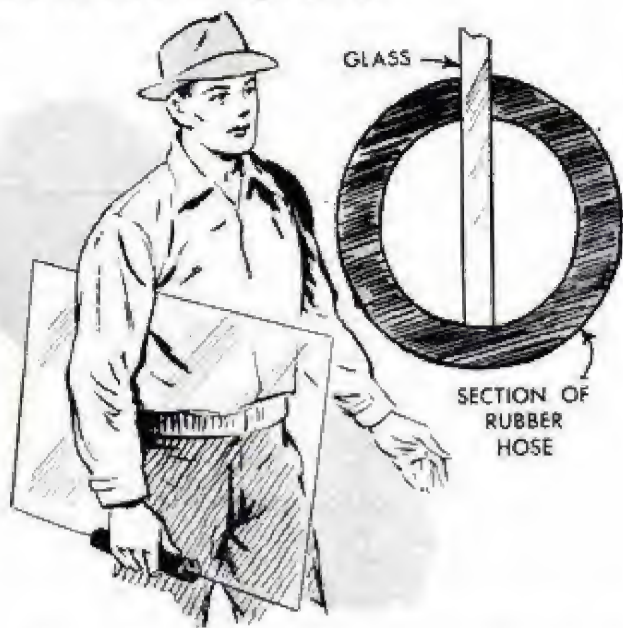
Having a generous capacity that makes it ideal for picnics and outdoor barbecues, this jumbo salt shaker is improvised from a 4-oz. fruit-juice bottle. Both the bottle and its press-on cap are washed and dried thoroughly. Then a $\frac{1}{4}$ -in. disk is cut from the center of the cork cap liner and a $\frac{1}{16}$ -in. hole is drilled through the metal exposed by cutting away the liner. The inside of the cap, including the cork liner, is coated with clear lacquer and the outside is painted in an appropriate color. After the bottle is filled with salt, the cap is replaced, its edges being clamped securely against the neck of the bottle with a pair of pliers. Although the lacquer will protect the metal to a considerable extent, it eventually will corrode. However, a new cap may be made in a few minutes when the original is no longer usable.



Walter E. Burton, Akron, Ohio.

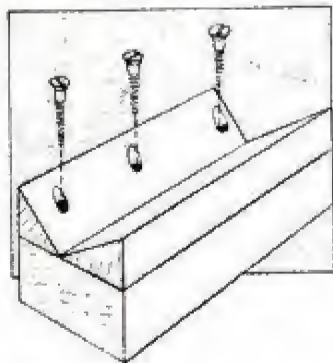
Thin stock is dressed easily on a jointer if the work is backed with a 2 x 4 of the same length. Be sure that the stock does not extend beyond either end of the backing, thus causing it to splinter.

Sections of Garden Hose Aid in Handling Glass



One homeowner found that a section of garden hose solved the problem of handling and carrying large, heavy panes of glass without causing discomfort to the hands. Cut 8 to 10 in. long, the section is slit lengthwise so that it may be slipped over the edge of the glass as shown. Longer sections may be utilized to provide protection for the bottom edges of glass which is to be placed in storage.

Make Your Own V-Block



If you are starting your home workshop on a limited budget, chances are you will do without some of the less important accessories, at least for a while. For example, if your initial investment in power

tools includes a drill press, you probably plan on buying a metal V-block in the future. However, to serve the purpose temporarily, a good V-block can be made from

Versatility . . .

It's hard to beat the electric handsaw as an all-around tool. Tops for building construction, the portable power saw now is coming into its own as a home-workshop tool. Even the man who owns one may not realize the variety of jobs it can do. A feature next month tells how this handful of whirling power can be used for conventional cuts as well as for forming butt joints, notching, making pocket cuts — even for sawing pipe, brick, cement and tileboard.

two blocks of hardwood which will take care of any occasional drilling job you might have to do. The triangular-shaped pieces which form the V of the block pictured in the detail are cut from a single square block by sawing it diagonally, lengthwise. When the two pieces are glued and screwed to the top of a short section of 2 x 4, they will form a 90-deg. angle. Note that the screwheads are driven into counterbored holes so that they will not interfere with the work.

Hugh Lineback, Stillwater, Okla.

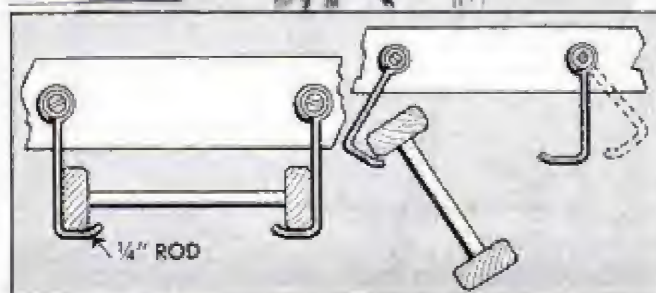
Sawdust Absorbs Varnish Remover

After applying varnish remover and allowing it to "work," experienced refinishers sprinkle the surface of the work with fine sawdust to absorb the thick-gummy residue. The mass is then removed with a scraper or stiff-bristle brush.

Storing Extension Ladder

The problem of where to store a long extension ladder is solved easily by suspending it from the joists in a basement or garage. All you need are four L-hooks pivoted to the joists by means of heavy screws. The hooks are bent from 1/4-in. iron rod. In use, the hooks are swung outward and one rail of the ladder placed upon two of them, after which the opposite rail of the ladder is raised upward and the other hooks swung under it. The outer ends of the hooks should be bent to form a slight U-shape so that there is no possibility of the ladder slipping off of them.

Perry W. Trout, Kansas City, Mo.



Replacing

GENERATOR BRUSHES



By Ed Packer

TO KEEP the car generator in good running condition, it is best to check the brushes occasionally. They should be replaced when worn to half their original length. Although the generator should be removed from the car to replace the brushes, it is not necessary to completely disassemble the unit. Simply remove the two through bolts which run the length of the generator housing and pull out the armature assembly. Then clean the commutator with 0/0 sandpaper and scrape any dirt from between the copper sections. This can be done with a piece of hacksaw blade, the sides of which have been ground slightly to reduce the width of the teeth. Use the blade to saw gently between the sections until a white dust is produced by the sawing. Before installing the new brushes, tape a piece of sandpaper around the commutator, as in the photo at the right. Then insert the commutator shaft in the end frame and place the brushes in their holders. Move the commutator back and forth in an arc of about an inch or so until the faces of the brushes are cut to the radius of the sandpaper. Doing this will insure that the entire surface of each brush comes in full contact with the commutator, and thus prevent overheating. Check to see that the brush lead is replaced in the holder in its original position, making sure that the terminal under the screw does not bind the brush. Also be sure that the terminal does not stand out from the brush holder far enough to become grounded on the generator frame. After it is replaced in the car, the generator should be repolarized by sending battery current through it. This can be done by momentarily "flashing" a



jumper wire from any hot lead (the starter terminal of the B post of the regulator) to the A terminal of the generator. The generator is properly positioned when the fan belt is aligned with the generator pulley and belt tension allows $\frac{1}{2}$ in. of up-and-down movement in the belt halfway between the fan and generator pulleys.

Solderless Ground Connection For Radios and Lightning Rods

A tight ground connection for lightning rods, radio and TV sets can be made by drilling two transverse holes $\frac{1}{4}$ in. apart and $\frac{1}{2}$ in. from the top of the ground rod. The bared end of the wire is inserted in the lower hole, bent back on itself and inserted in the top hole. Then the metal at the end of the rod is upset by hammering in order to clamp the wire in the holes.

Arthur Trauffer, McClelland, Ohio.

KNOW YOUR CAR'S NERVOUS SYSTEM



TRUCK-TYPE HORN



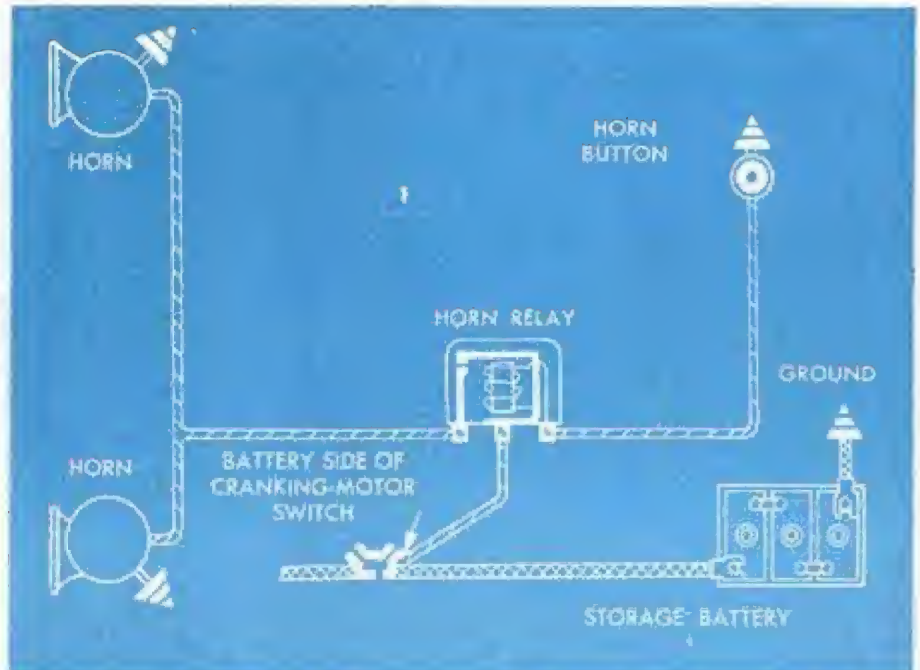
HORN RELAY



PASSENGER-CAR HORNS, MATCHED SEASHELL TYPE



BUS-TYPE HORN



"THE HORNS"

By W. K. Mitchell and Howard B. Birt

ALMOST WITHOUT EXCEPTION, modern passenger cars are equipped with electrically operated horns of the vibrating-diaphragm type. In most cases the horns are mounted in pairs somewhere in the motor compartment and usually as near the front of the car as possible. Where a pair of horns is used, a musical, blended tone can be provided. Matched horns used on General Motors cars, for instance, are tuned to the musical notes E flat and G, which have been found to produce a pleasing and yet effective warning signal. Examples of three widely used types of horns are shown in the photos above. The passenger-car horns pictured are known as the "sea shell" type because of their distinctive shape.

Conventional electric horns operate on a magnetic principle similar to that of a door buzzer used in your home. Current from the battery flows through the windings within the horn power plant when the circuit is completed at the horn button, or ring, on the steering wheel. See the wiring diagram, Fig. 1.

The magnetic attraction of the armature

toward the pole causes a tension and slight movement of the diaphragm. The movement opens the contact points in series with the horn winding, breaking the circuit. See the cutaway drawing of a horn in Fig. 3. When the current is interrupted, the armature returns to its original position, relieving the tension on the diaphragm. The slight return movement of the armature and diaphragm allows the contact points to close, again completing the circuit. This cycle is repeated many times per second, the same as in your door buzzer and results in a rapid vibration of the diaphragm, which produces sound. The pitch or tone of the horn depends on the number of vibrations per second—the more rapid the vibration, the higher the pitch.

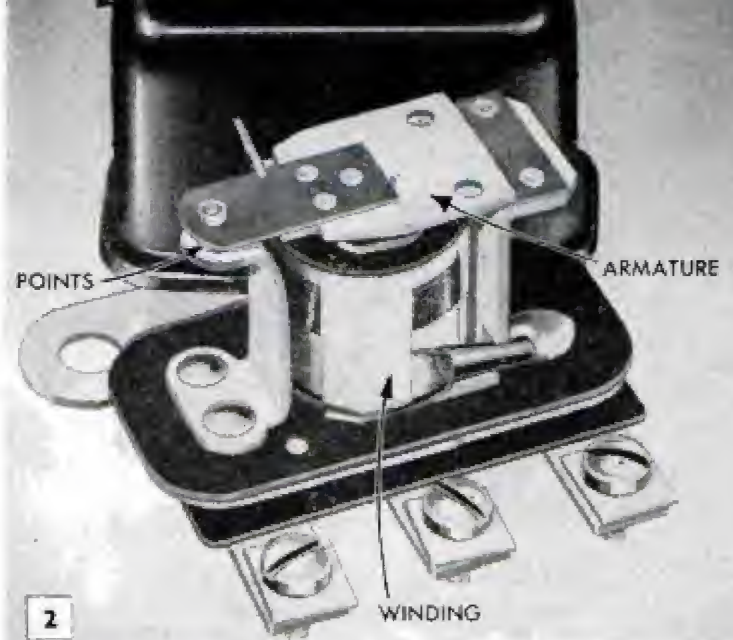
In one respect the electric horn is similar to the auto starter, in that it is deliberately designed to operate under a terrific overload for short periods of time. A typical passenger-car horn will draw approximately 18 amp. of current while sounding. Naturally, it cannot be operated continuously over a prolonged period of time without

danger of burning electrical connections.

Because of this high-amperage consumption, a relay and two electrical circuits are used to operate the horns. The relay, which is pictured in Fig. 2 with its cover removed, is merely a switch that is actuated electrically by means of the horn button or ring on your steering wheel. A low-amperage current flows from the relay to the horn button and back to the relay, passing through a coil, or electromagnet, in the relay when the button is depressed. This current energizes the coil, which then attracts the relay armature and closes the contact points, or switch, inside the relay. These points are wired into the second, or high-amperage circuit which operates the horns. The horns will continue to sound as long as the horn button is depressed. The reason for the two circuits is to make as direct an electrical connection as possible between the horns and battery, thus permitting full voltage at the horns while avoiding the need for running heavy wiring to the horn button. Heavy wire would be necessary, of course, if the relay was not used.

All too often horns are replaced unnecessarily when trouble occurs, simply because the checking and adjustment procedures generally are not understood. Actually, it is a fairly simple matter to check and adjust the horns, the horn relay and the horn circuit. Any mechanically minded motorist can maintain his horns in top-notch operating condition and make necessary adjustments, without special equipment.

Should either or both horns become inoperative, or operate only intermittently, a thorough check should be made. First make sure the battery is charged sufficient-



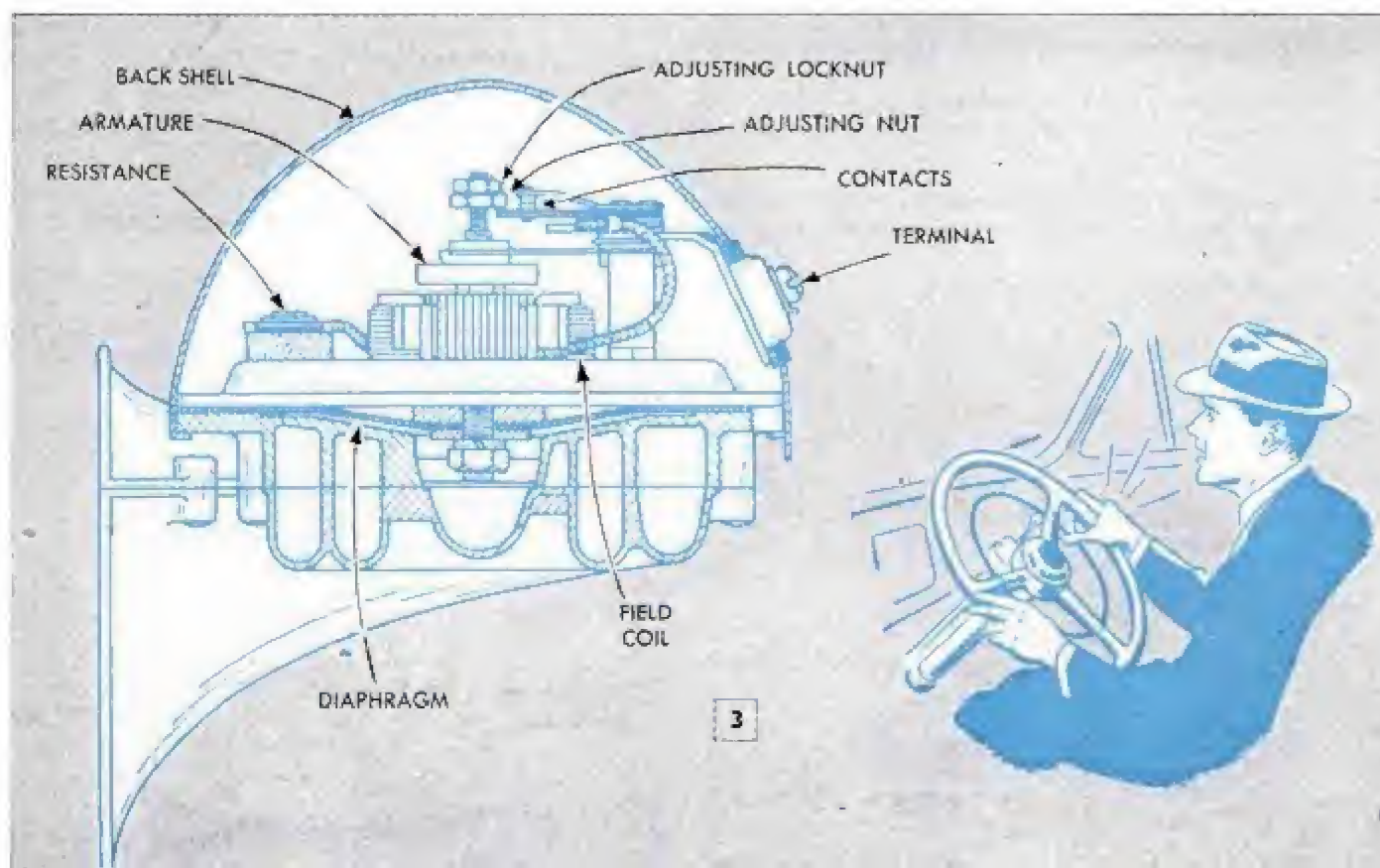
Photos and information courtesy Delco-Remy Division, General Motors Corp.

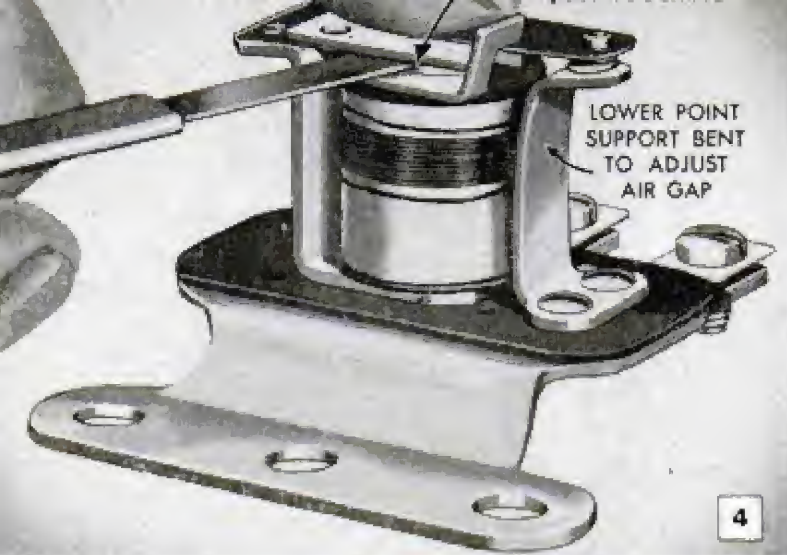
ly to crank the engine. If it is not, it must be recharged before the horn checks and adjustments can be made satisfactorily.

Clean and tighten all connections in the horn wiring circuit, including grounds. Look for frayed insulation, or breaks in the wiring. If necessary, check for defective wiring by connecting separate test leads from the horn to the battery.

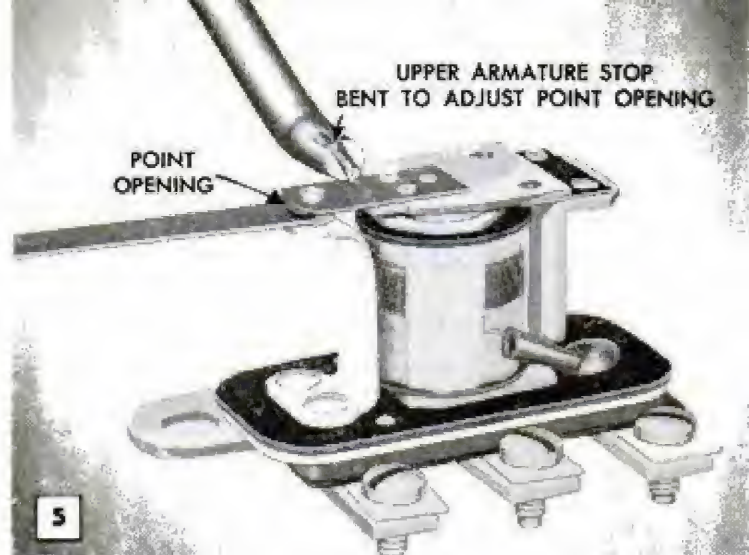
A loose connection or poor contact at the horn button may cause the horn to operate intermittently. Shunt around the horn button to determine whether there is poor contact at the horn-button switch.

If the above procedures do not locate the source of trouble, check and adjust the horn relay. This entails checking the point opening, the air gap and closing voltage, or low amperage circuit. Checks and adjustments

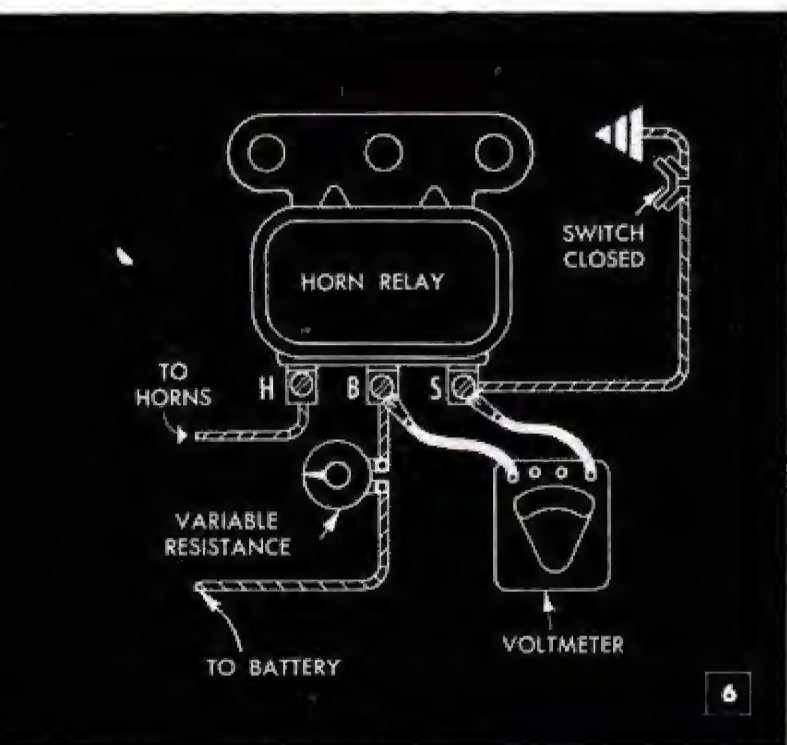




Relay air gap is checked with gauge, as shown above, with points barely touching. Lower point support is bent to adjust gap to manufacturer's specifications



If check indicates that relay contact-point opening is causing trouble, opening can be adjusted by bending upper armature stop with tool slotted at one end



Wiring diagram shows how voltmeter and variable resistance are connected to check relay closing voltage

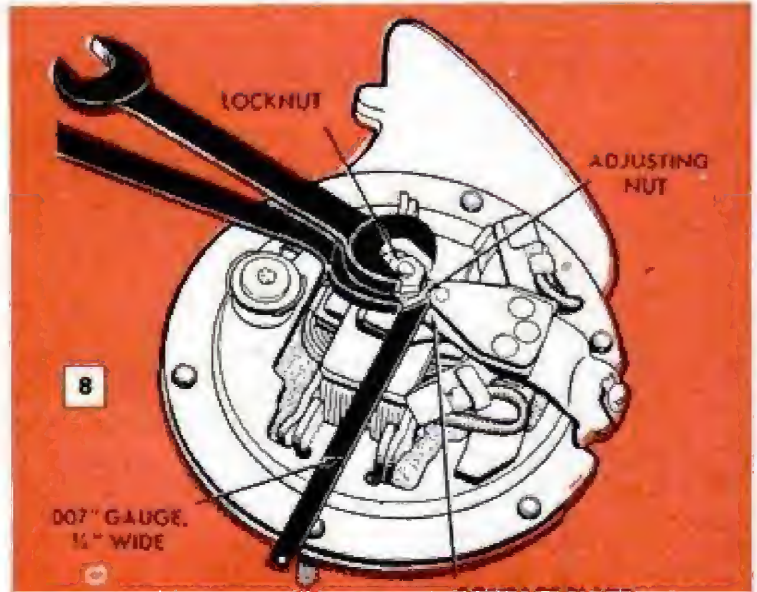
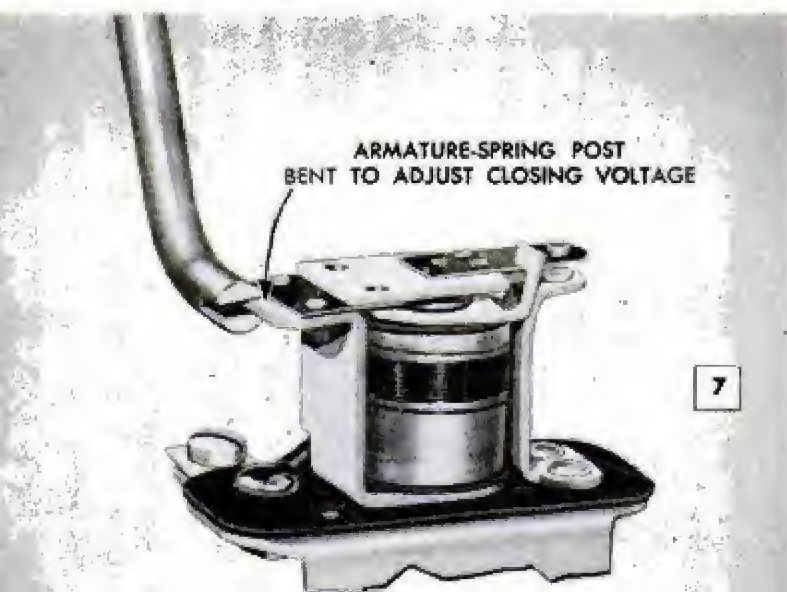
Bending armature-spring post downward increases closing voltage. Bending it upward decreases voltage

of the air-gap and contact points openings are made with the battery disconnected.

Check the horn-relay air gap with the points barely touching, as in Fig. 4, and adjust by bending the lower point support. Check the relay contact-point opening and adjust, if necessary, by bending the upper armature stop, as in Fig. 5.

To measure the horn-relay closing voltage, connect a variable resistance of 10 ohms, and a voltmeter, as shown in Fig. 6. With the horn button closed, slowly decrease the amount of resistance and note the closing voltage. Adjust the closing voltage to manufacturer's specifications by bending the armature-spring post with a slotted tool as in Fig. 7. Bending it downward increases the closing voltage and bending it upward decreases the closing voltage.

Fig. 8 indicates the proper method of adjusting a typical, seashell-type electric horn. Remove the horn back shell and check for loose or broken wiring or defective soldering. Make sure there is no dirt, metal shavings, or other foreign material in the air gap. Clean the air gap if necessary. Then insert a .007-in. gauge, not



more than $\frac{1}{4}$ in. wide, between the adjusting nut and the contact blade. Loosen the locknut and turn the adjusting nut down until the horn will not blow. Back off the adjusting nut (slightly less than $\frac{1}{10}$ turn) and tighten the locknut. See if horn will blow. Repeat this procedure until the horn just barely blows. Then remove the gauge and replace the cover.

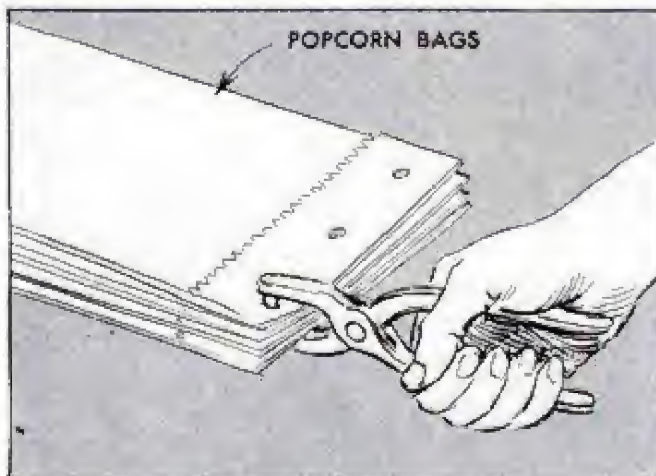
If it is found that a low place has been worn on the adjusting nut where the contact blade vibrates against it, either replace the nut or turn it over so that the worn place is on the top side. Otherwise, the worn portion of the nut may prevent obtaining perfect adjustment.

Occasionally a passenger-car horn gets "stuck," and blows continuously — frequently when the car is unoccupied. In most cases this is caused by a short circuit in the horn button, or horn-button wiring. It can be caused, however, by stuck contact points in the horn relay, or other maladjustments. In such an emergency, the battery, or "hot," wire should be removed quickly from the center horn-relay terminal. This will disconnect the horn from the battery and silence the horn until a complete checkup can be made to locate the trouble. The bare end of the battery lead should be tied back or taped so that it cannot short circuit against any metal part.

The above checks and adjustments are simple and, if properly followed, will make it possible almost without exception to locate and correct horn troubles, and thus save the cost of replacing the horns. * * *

Holes Punched in Popcorn Sacks Prevent Theater Disturbances

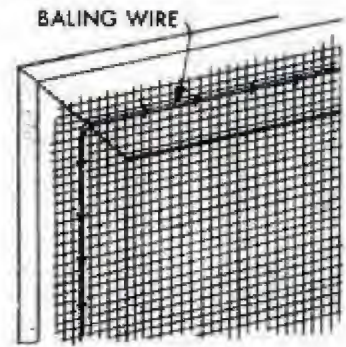
In order to prevent disturbances caused by children inflating and bursting empty popcorn bags in a theater, one operator provided holes in the bottom of each bag. This was done by stacking several bags at a time and making the holes with a ticket punch. Any punch that will make a small hole may be used.



Screen Staples Reinforced With Length of Wire

To help prevent screen wire from being torn loose around the staples, reinforce them with a length of piano or stove-pipe wire. Lay the wire along the edge of the screen and secure it with staples as shown. Molding may be nailed over it afterwards, if desired.

A. H. Waychoff, Phoenix, Ariz.



Metal Guard on Bow Saw Prevents Hand Injury

Woodmen, railroad workers and others who use bow saws for heavy work avoid painful hand injuries by fitting a sheet-metal guard on the saw frame

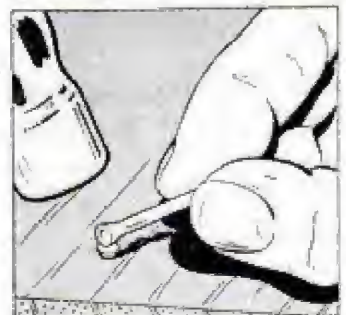


at the point where it is normally grasped for one-hand operation. The guard prevents the fingers from being caught between the frame and the material being cut should the blade suddenly slip or skid when sawing unsupported work. The guard is made from heavy sheet metal or $\frac{1}{8}$ -in. flat steel bent to a U-shape with the ends drilled and taper-reamed to fit tightly over the tubular saw frame. If desired, the guard can be tack-welded to the frame to hold it securely in place.

Nail Set for Emergency Use

If you wish to set a nail when no nail set is available, try using the head of another nail on the head of the driven nail as shown. Another simple way of setting a nail is by filing the point of a large nail and utilizing it in the same manner as you would a nail set.

R. F. Donovan, Guttenberg, N. J.



☐ A brown or black eyebrow pencil rubbed over spots on black and brown furniture, worn-out areas on handbags, gloves, shoes and belts will camouflage the spots. Follow by rubbing with soft cloth or tissue napkin.

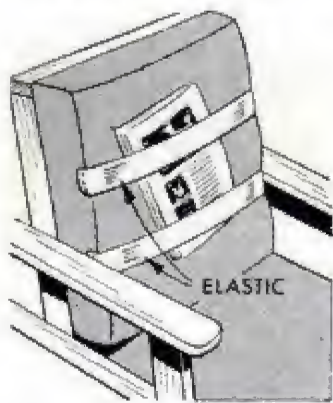
Baby Crib Improvised From Basket



A laundry basket and a household broom are all that is needed to furnish you with a portable and inexpensive crib for rocking a baby to sleep at home or when traveling. The basket is supported at both ends by the broom which is placed across two chairs as shown.—Rose Edwards, Columbia, Mo.

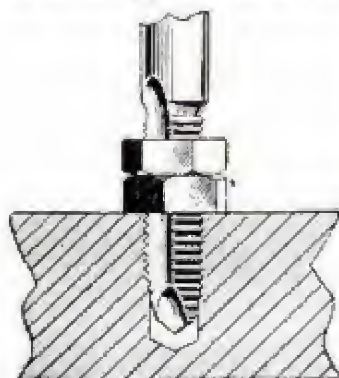
Lawn-Chair Cushion Has Straps For Holding Magazines

Annoyed by having newspapers and magazines blown away frequently when left in the seat of a lawn chair, one homeowner attached elastic straps to the back cushion of the chair to hold the periodicals in place. The straps can be made from cloth, if desired, and strong thread is recommended for use when sewing the straps to the cushion.



Nuts on Tap Serve as Stop To Prevent Breakage

Snapping off a tap in a blind hole won't happen if two nuts are used as a depth stop. Normally, there is no way of telling when the tap touches the bottom of the hole, but the stop makes it easy to watch the depth of the tapping operation and to stop the tap as soon as the nuts touch the surface of the work. The nuts are simply run onto the tap a



predetermined distance and jammed together to lock them in place. In the case of a deep hole, it is recommended to back out the tap occasionally to clear the chips, as the nuts will hinder, to some extent, proper clearing of the tap.

Fred Lettino, Astoria, L. I., N. Y.

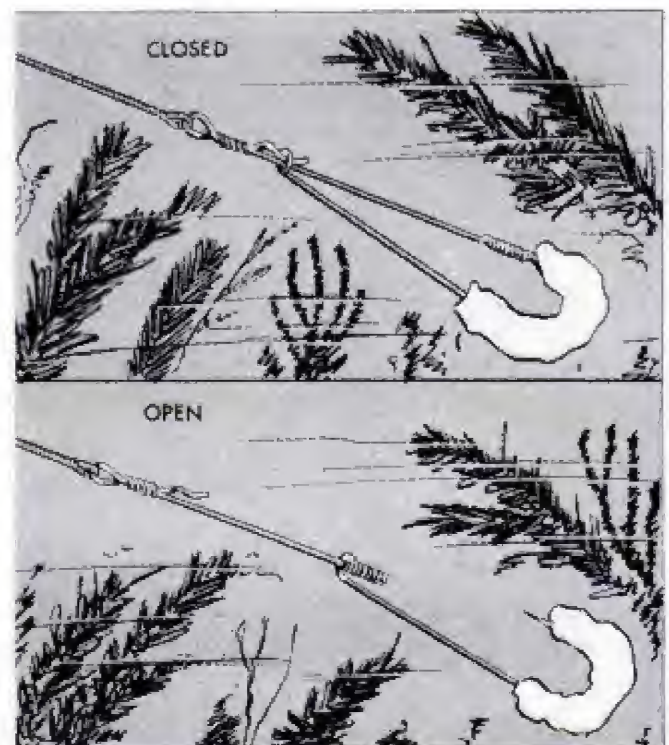
Sealing Knots in Lumber

Knots in lumber eventually will "burn" through if covered directly with ordinary oil paint. This may be prevented by giving each knot a preliminary coat of shellac before painting.

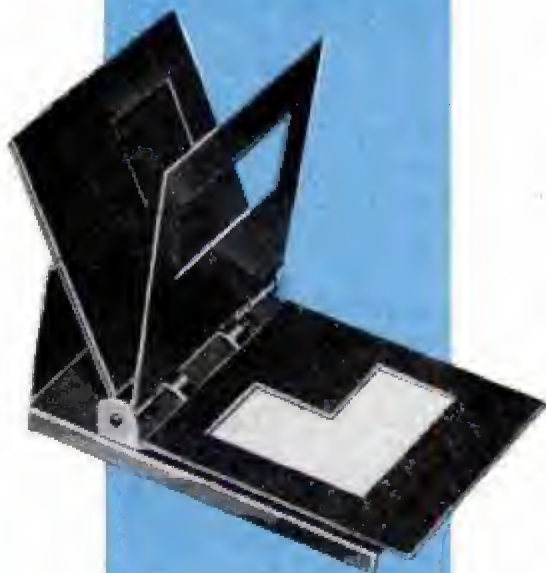
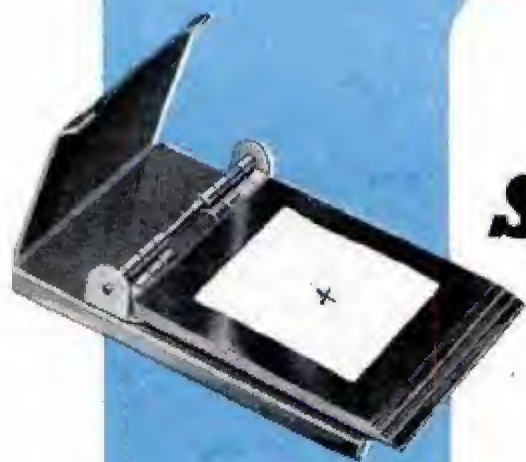
Snagproof Fishhook

Troubled by his tackle continually snagging on logs and water plants when fishing a bait deep in the water, one fisherman devised this snagproof hook. It consists of an ordinary eyed fishhook fitted with a sliding guard made from stainless-steel wire. One end of the wire is twisted to form a tight coil that slips over the point of the hook when the guard is in position. The other end of the wire is bent back on itself to form an eye to which the line is tied. The free end of the wire is then given a few turns around the standing part to secure the eye, and the end is then bent to form a friction catch which is forced through the eye of the hook. This holds the guard in place as shown in the upper detail. When a fish takes the bait, the added tension on the hook releases the friction catch and permits the guard to slide through the eye of the hook as in the lower detail thus baring the barbed point.

Herbert E. Fey, New Braunfels, Tex.



Actual-size, sample test print showing four different exposures of 5-sec. variation. Correct exposure time (15 sec.) is determined by the best tone of four exposures



SPOT ANALYZER ***For BETTER*** ***ENLARGEMENTS***

By Hugh Smiley, Jr.

WHILE ITS COST is somewhat insignificant compared to that of other darkroom materials, enlarging paper is still too expensive to waste unnecessarily, especially in the case of large-size sheets. Yet many times the home-darkroom enthusiast wastes whole sheets of paper in determining the correct exposure. Not only can you save paper with a spot analyzer but you will be better able to judge the density of the negative beforehand. As a result, the tonal quality of your enlargements will be improved considerably.

Based on the test-wedge principle of test printing, this unique analyzer, which uses only a 2-in.-square piece of printing paper, permits four separately timed print areas to be made around a central point. By varying the exposure time five seconds for each area and then developing the test print, the exposure best suited to the density of the negative can be readily determined by analyzing the tonal qualities of each separate exposure. In the sample test print shown above, you'll note that the correct exposure for that particular negative would be approximately 15 seconds. If desired, a second test print may be made, using separate exposures of 12, 14, 16 and 18 seconds which will give a closer comparison of tones to determine the exact exposure. Thus, the saving in time and material is considerable, as exposure, development and emulsion

Stop guessing the right exposure for your enlargements. Make sure beforehand by analyzing a multiple test print



Here are all the parts cut and ready for final assembly. Two sheet-metal screws are used to fasten the paper holder to the base member

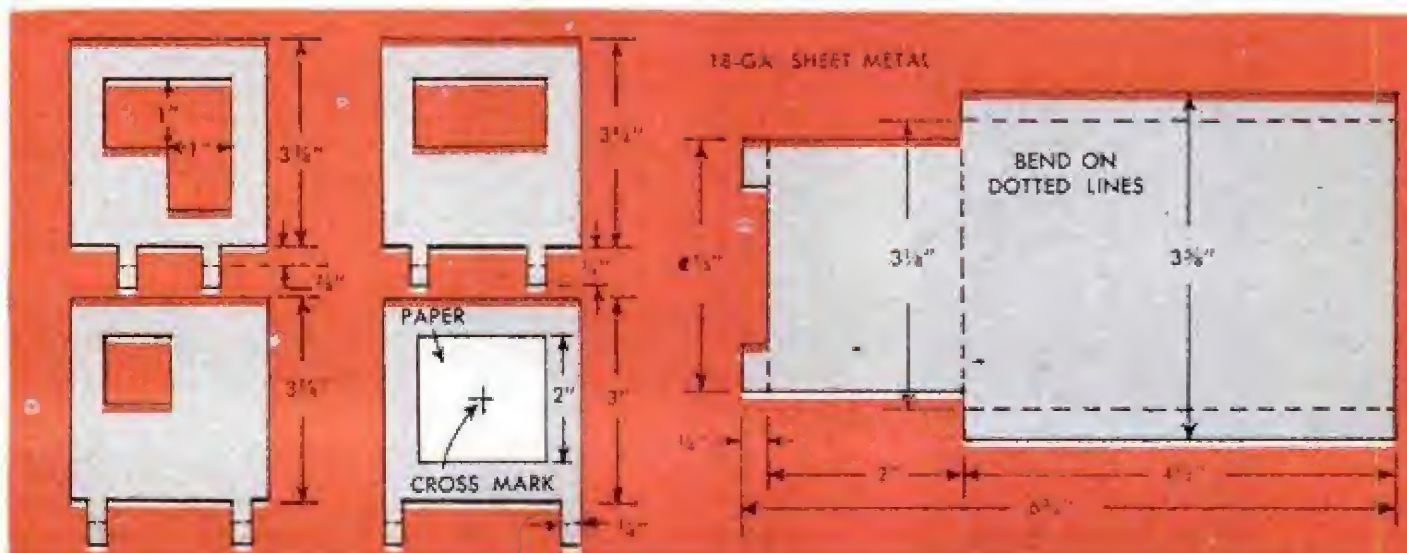
conditions are identical in both the test and the final print.

In use, the analyzer is placed on the enlarger base and spotted under any portion of the image desired. With the enlarger turned off, load the analyzer with printing paper. Then with all the masks raised up, turn on the enlarger for the chosen interval (five seconds is about average). Follow by lowering the second mask over the exposed paper and make a second exposure of five seconds. Do this with the third mask, being careful in each case to avoid moving the analyzer. The test print is developed in the usual way and after a short fixing, it can be viewed safely under white light.

Patterns for the five parts required to make the analyzer are pictured below and on the facing page. The original parts were cut from 18-ga. sheet aluminum, although other metal can be used. The masks are

made to hinge independently by forming the extending tabs over a pin. This is done by clamping all four masks together in their proper order and then forming offsets in the tabs by pressing them in a vise and against a metal backing strip. The top photo in the series on the opposite page shows how the tabs are hammered over the edge of the same backing strip, after which the forming is completed by hammering the ends of the tabs over a length of $\frac{1}{8}$ -in. brazing rod. Channels which hold the paper in place are formed over a steel rule or similar shim stock as pictured in the lower photo of the series. Mark the overlapping window locations in the three masks on the cover of the analyzer so they will center over the test paper. Assemble the masks and drill a tiny hole through the stack at each corner of the windows. This method permits accurate spotting of the windows in each mask for perfect registry, after which each one is carefully cut out and filed square. Two self-tapping screws hold the base assembly together, and beads of solder on the ends of the hinge pin hold it in place. The underside of the masks should be painted flat black to kill light reflections on the test paper. The analyzer is completed by cementing a 2-in. square of white paper to the cover and then inking a cross mark in the center to serve as a target. The paper provides a white area on which the image can be focused sharply before loading the analyzer with printing paper and making individual exposures. ★ ★ ★

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Offset hinge tabs on masks are formed by clamping stack to backing plate and hammering tabs over edge



Brazing rod, which serves as hinge pin, is used in forming eyes in ends of tabs by tapping metal around it



Channels which guide the paper are formed by bending the metal over a suitable shim such as a steel rule

Clothespins Make Practical Spiles For Tapping Maple Trees

Anyone having a few maple trees which they wish to tap to obtain the sap for syrup or sugar need not bother cutting and grooving special pegs to be used as spiles. Common clothespins not only make excellent spiles which wedge firmly in place, but also provide a natural hook for the bail of the pail. Clothespins are inserted at a slight angle to permit the sap to flow out through the slot in the pin.



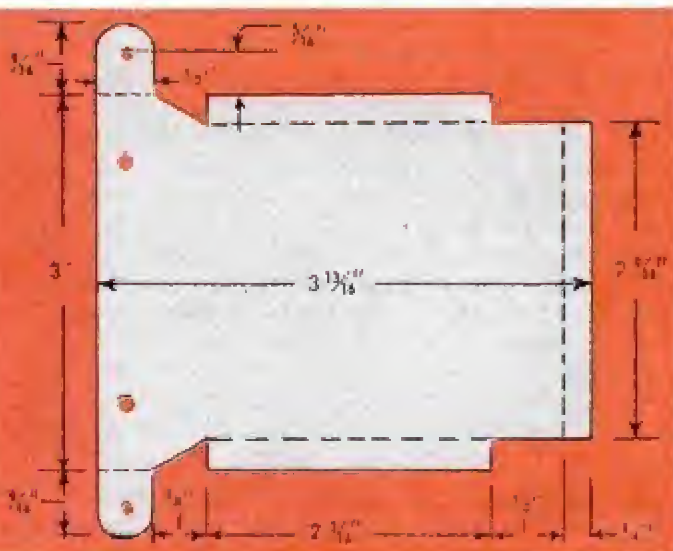
Ashes Keep Cutworms From Plants

Instead of attempting to protect tomato plants from cutworms with bulky paper wrappings or various collar contrivances, I simply scoop out an inch or more of topsoil within a radius of approximately 3 in. around each plant and fill the hole with sifted coal or coke ashes. The ashes repel the pests quite effectively, permitting the plants to grow unmolested to full maturity without being damaged or destroyed. Care should be exercised when scooping out the soil to prevent the possibility of exposing or damaging the roots.

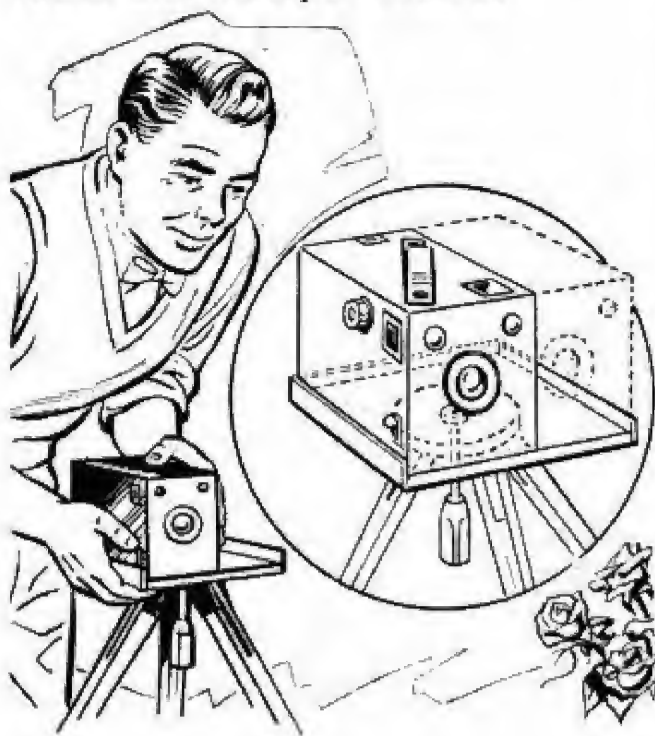
Edward Copplestone, Saugus, Mass.

Headlight Shell Holds Flashlight To Make Repairs Under Car

When it is necessary to use a flashlight under a car, an old headlight shell will provide an ideal support for directing the light in almost any direction desired. Also, it will be found useful for supporting a flashlight when changing tires on the road after dark. If a shell is not available, any bowl-shaped utensil set upright with the light placed against the side will do the job nicely. — G. E. Hendrickson, Argyle, Wis.



Box Camera in Tray on Tripod Takes Stereoscopic Pictures



Do you know that excellent stereoscopic pictures for viewing in a stereoscope can be made with your box camera? All you

need is a shallow wooden tray mounted on a tripod. For the average 120-size box camera, a tray measuring 5 in. deep and 6 in. wide will do. In each individual case, the tray must be of a size which will allow the lens axis to be shifted approximately $2\frac{1}{2}$ in. for each exposure. The tray is made by nailing $\frac{1}{8}$ x 1-in. strips around three sides of a base of $\frac{1}{2}$ -in. wood. A hole is made in the center of the tray for the tripod screw and counterbored to recess the nut flush. In making stereo shots, the camera is placed at one side of the tray as illustrated and the first exposure made. After advancing the film, the camera is shifted to the opposite side of the tray and the second exposure is made. Needless to say, the subject must remain in the same position for each exposure.

Testing Flash-Gun Cells

To be sure that your flash gun won't misfire, always check the strength of the dry cells before shooting an important picture. A pocket ammeter carried in your photo kit allows you to check the cells in a few seconds, and any cell which reads less than 10 amps, should be replaced.

Popular Mechanics Bookshop

Bugs in Your TV Set?

Your television picture isn't quite up to par. It's beginning to blur a little, the edges are fading off, or you can't seem to keep it centered on the screen. Or perhaps you snap on the set and *poof!*—no picture at all. You figure you're in for a sizable repair bill and, just as bad, you'll miss your favorite programs for a good many days.

All About Television is a book written in plain language for the average set owner, the man who may never have replaced a radio tube in his life. It tells you what to look for in buying a new set, how to install an antenna, how to diagnose reception troubles. It takes you step by step through the various (and surprisingly simple) repairs you can make yourself. Best of all, it tells you when you really do need a serviceman. The cost of one service call will pay the price of *All About Television* several times over. Only \$3.00 for a clothbound edition. Order by mail from Popular Mechanics Press, 204 E. Ontario St., Chicago 11.

Power Tools

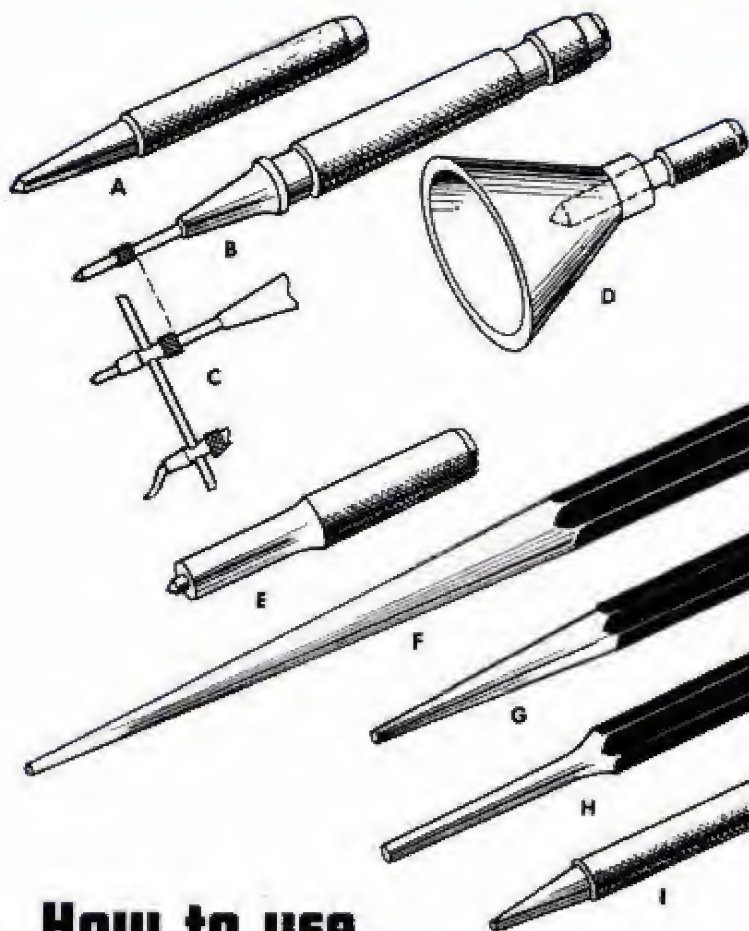
Whether you're planning the purchase of your first power tool or already have an up-to-snuff workshop, you'll find a heap of

information tailored to your own needs in *Power Tools and How to Use Them*. On the first page you start laying out your shop, and succeeding sections give detailed information on virtually every power tool available for the home workshop, from the smallest tools for hand carving to precision milling machines. As a topper you'll find many projects for power tools. Order from Popular Mechanics Press, 204 E. Ontario St., Chicago 11, (clothbound \$2.50).

"Kinks" and Hints for Craftsmen

There's something special in the sparkling new 1953 edition of that famous old title, *Popular Mechanics Shop Notes*. A complete course of instruction for lathe operators, it's written for this edition by James R. Ward, *PM's* shop notes and crafts editor. And that's just one feature in a book crammed with know-how for the workshop man. There's a section devoted to power tools you can make yourself, another on drill presses, many pages of interest to the farmer and a full department for the automobile owner—besides hundreds of "kinks" and hints for craftsmen. The price of this 240-page book is only \$1.00 at your newsstand or by mail from Popular Mechanics Press, 204 E. Ontario St., Chicago 11.

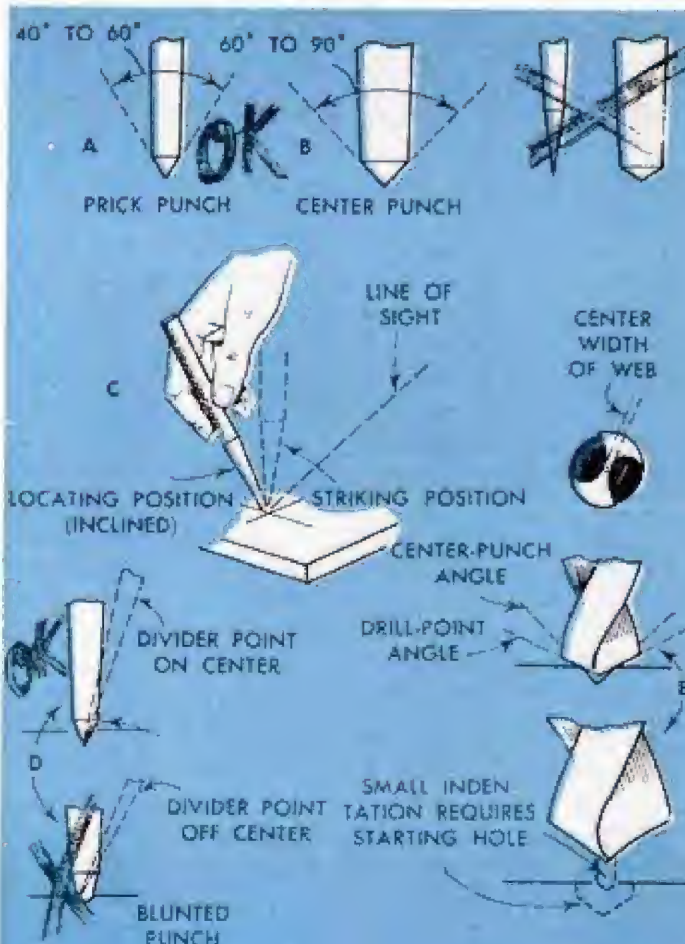
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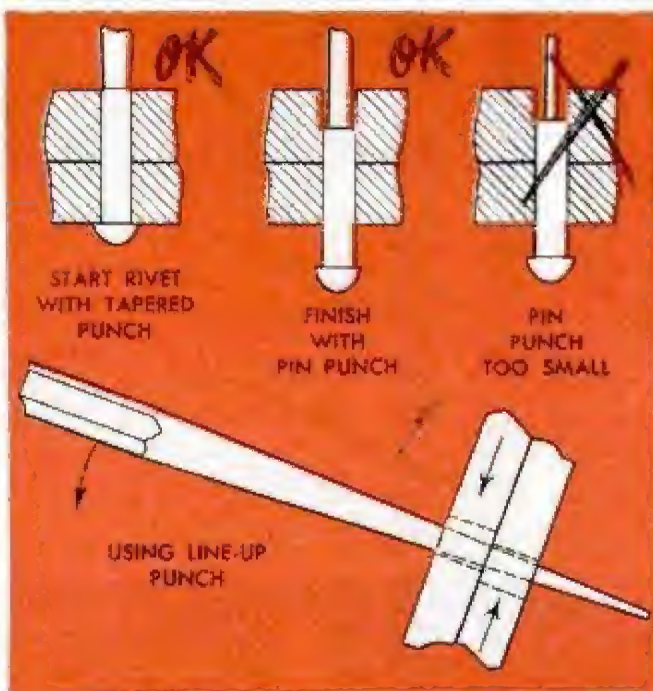
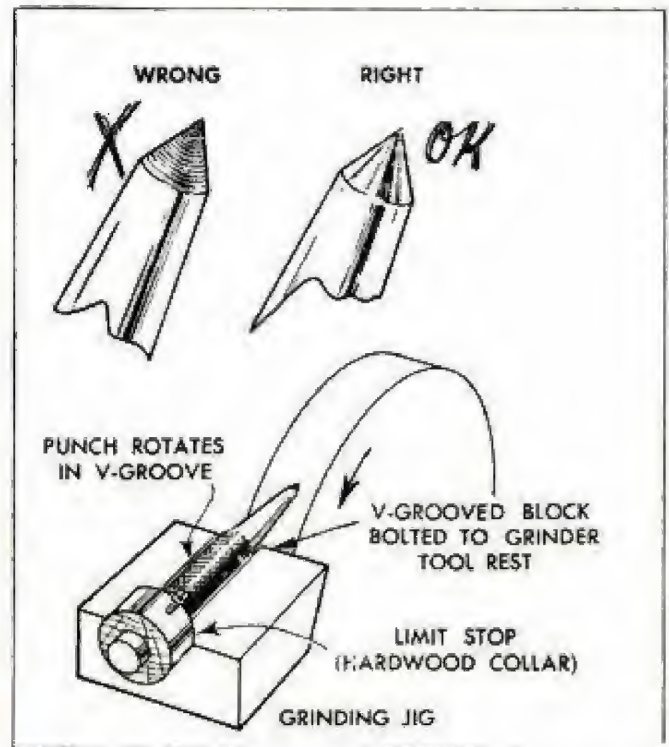


How to use HAND PUNCHES

ACCURATE LAYOUTS on metal begin with precise punch marks made on the surface. The accuracy of the indentations determines to a certain extent the accuracy of the work, especially when starting drills and laying off with scribes and dividers from a center line or base line. That's why diemakers, machinists and others who regularly use center punches and prick punches in layout work take special care to prevent damage to the needle-sharp points. Various types of punches in common use are shown above, in details A to L inclusive. Details A, B, C, D and E show sharp-pointed punches. The others, F to L inclusive, classify as punches but are used for various types of work.

Center punches: The details at the right, A to D inclusive, show methods of using sharp-pointed punches in layout work and in making indentations in metal for starting drills. One trick in setting the point of the punch accurately is shown in detail C. The punch is inclined so that the point is seen readily, and after locating the point, the punch is returned to the vertical position

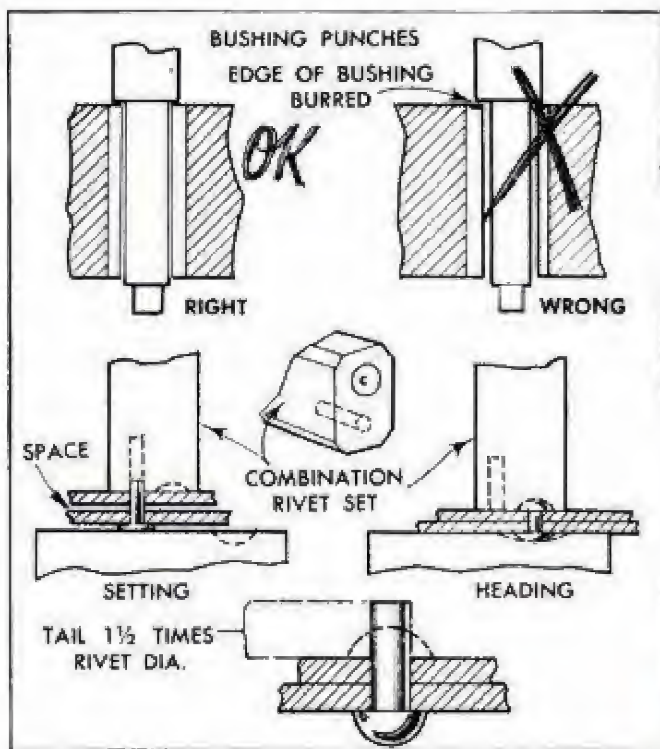




before striking with the hammer. In hole layout, the holes are located with light prick-punch marks and if large holes are to be drilled, starting holes or pilot holes are first drilled to assure concentricity. Indentations in the metal to anchor one leg of dividers should be made with a needle-sharp punch, as otherwise the dividers may shift. Sharp-pointed punches should always be ground concentrically so that the point will be located exactly on the axis. A simple grinding jig made as in the right-hand detail above will do the trick. A similar jig is pictured in use in the photo at the left. The punch is guided by a V-grooved block of hardwood and grinding depth is limited by a hardwood collar attached to the barrel, or body, of the punch by means of a setscrew. Octagon punches can be concentrically ground by slipping the body of the punch into a short length of tubing. In the upper details on the preceding page, de-

tail B shows one type of automatic center punch which is a favorite with machinists. No hammer is required as pressure on the movable sleeve, which serves also as the handle, compresses a spring. When pressure is built up to a certain point a striker is released. The striker delivers a sharp blow on the point. This type of punch also is supplied with adjustable spacing arms, detail C, which are used to locate and punch centers equidistantly along a scribed line. The bell punch, detail D on the preceding page, is self centering and is made especially for marking centers on round stock. A similar type, detail E, is supplied in a range of shank sizes and is designed for laying out registering holes on matching pieces of stock.

Pin, machine and lineup punches: Pin punches are used for driving out pins, rivets and keys. They come in a wide range of sizes and have straight round shanks and flat faces. Machine and lineup punches are similar except that the shanks are tapered. The shanks of lineup punches are much longer than either the pin or machine punches. In starting a rivet or pin, first use the machine punch to start, or "break" the rivet. Then finish driving it out with a pin punch. The reason for this procedure is that the tapered shank of the machine punch has much greater strength than the straight shank of the pin punch. In driving out pins and rivets, select a pin punch having a shank diameter only slightly smaller than the rivet or pin, as otherwise the shank may be broken. Lineup punches are used to align parts which are to be bolted together as in machine assembly. The long tapering shank will enter holes which are out of register and by moving the punch sidewise the

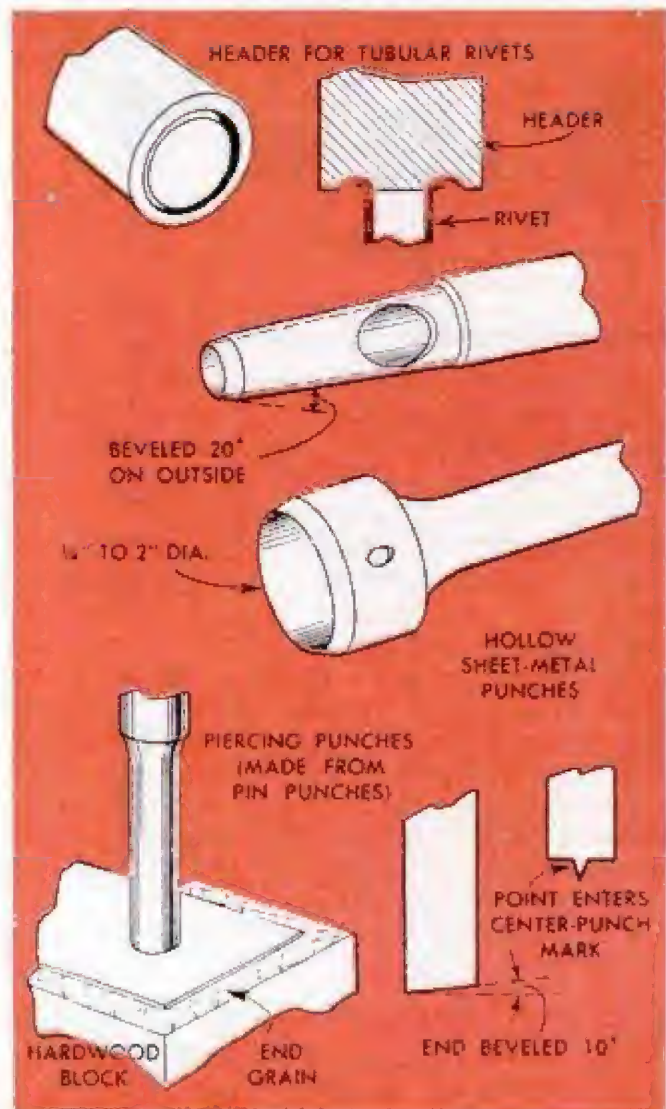


holes can be brought into line and the bolt inserted.

Bushing punches, or drivers: Small bushings usually are inserted or driven out with a bushing punch, or driver, as in the upper details above. Generally these punches have stepped shanks of two or more diameters and are supplied in a variety of sizes. The important thing in driving bushings is to use a punch of the correct size. If the punch is too small, the end of the bushing may be upset or burred.

Riveting punches, or sets: The combination setting and heading punch shown in the lower details above is widely used in hand riveting. It is rectangular in shape and has a hole drilled in the end to take the tapered point of the solid rivet in a fairly snug fit. A shallow concavity, or "dimple," ground in the same end of the punch is used to head the rivet after setting. Flat-headed solid rivets are backed with a rivet bolster or anvil. Round-headed rivets fit into dimples ground in the bolster. It is important that the tail of the rivet project only $1\frac{1}{2}$ times its diameter after setting. If shorter, the upset end will have greatly lessened holding power.

Tubular-rivet header: Tubular rivets, and also split rivets, are headed with a tool like that shown in the upper details at the right. The header is turned with a short projection at one end which enters the hollow end of the rivet. A concave groove turned in the end of the header at the base of the projection turns, or rolls, the rivet edge down to form a clinching rim. On soft materials, such as fabrics and leather, thin washers are sometimes placed over the end of the rivet before clinching.



Hollow and piercing punches: The center and lower details above show two common types of hollow punches and the solid piercing punch. The hollow punches have beveled cutting edges and are made for both metals and fabrics. Piercing punches are used to form rivet holes and for decorative work on sheet metal. They must be sharpened often at the bevel indicated. ★ ★ ★



Improved Pig Brooder

To eliminate the necessity of training newly born pigs to find their way to a centrally located brooder, one farmer utilizes heat lamps mounted inside galvanized buckets in improvising a separate brooder for each pen. The metal socket of an extension cord is soldered in a hole cut in the bottom of each bucket and fitted with a 250-watt infrared heat lamp. Bails are removed from the buckets and soldered near the bottom rims to suspend the buckets upside down from the rafters over the pens. The lamps not only supply heat to warm the sow and attract the little pigs, but also help to keep the pen dry. The number of lamps used will be determined by the amount of heat required in each pen.

A. M. Wettach, Mt. Pleasant, Iowa.

Effective "Scarecrow" for Orchards

Crows, blue jays and other birds destructive to orchards can be frightened away by hanging 4-in. squares of roofing paper on lengths of clothesline which are strung between the trees. Using one or more lengths of line, depending on the size of the orchard, tie from 12 to 24 squares on each line, spacing the squares about 2 ft. apart. For best results, hang the squares two or three weeks before the fruit is ready for picking, as it is likely that the scarecrow will lose much of its effectiveness if left up long

enough for the birds to become accustomed to it. If you wish, try substituting squares of sheet aluminum for the roofing paper. The reflective metal not only will sparkle in the sunlight, thereby adding to its effectiveness, but also will withstand weathering better than the roofing paper.

Charles L. Stratton, Hollis, N. H.

Chick Watering Fountain Anchored by Large Spike

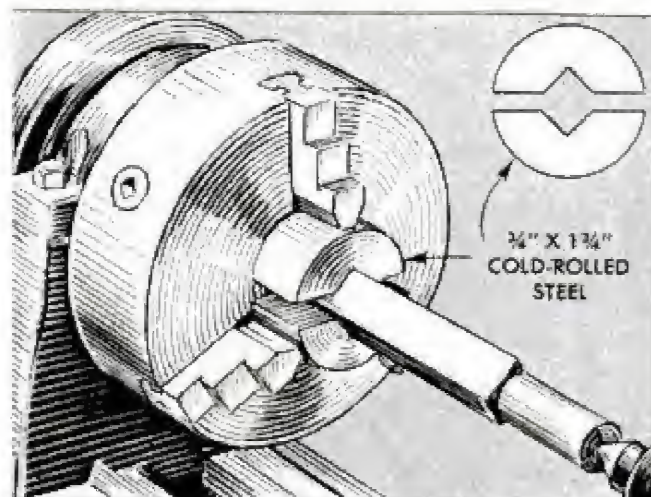
A watering fountain for small chicks that are permitted to run in open pens can be anchored in a level position on uneven ground by means of a large spike soldered to the bottom of the fountain. As a result of this, when the spike is pushed into the ground, the fountain may be maintained in a vertical position without the need for blocking. A harrow tooth or a railroad spike with the head removed may be adapted easily to serve the purpose.



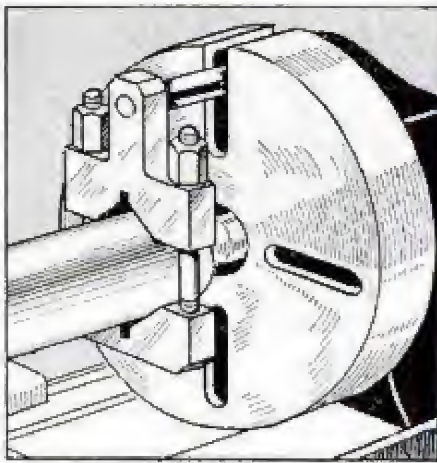
Adapter Holds Bar Stock In Three-Jaw Chuck

When a four-jaw independent chuck is not at hand to hold square bar stock, a universal chuck can be adapted with this simple two-piece fixture. It consists of nothing more than a steel disk broached with a square hole and sawed in half. When placed around the work, the V-notch in each half of the disk automatically centers the work as the chuck jaws are tightened. Size of the work to be chucked determines the size of the fixture. A disk 1 3/4 in. in dia. will accommodate up to 1-in.-sq. stock.

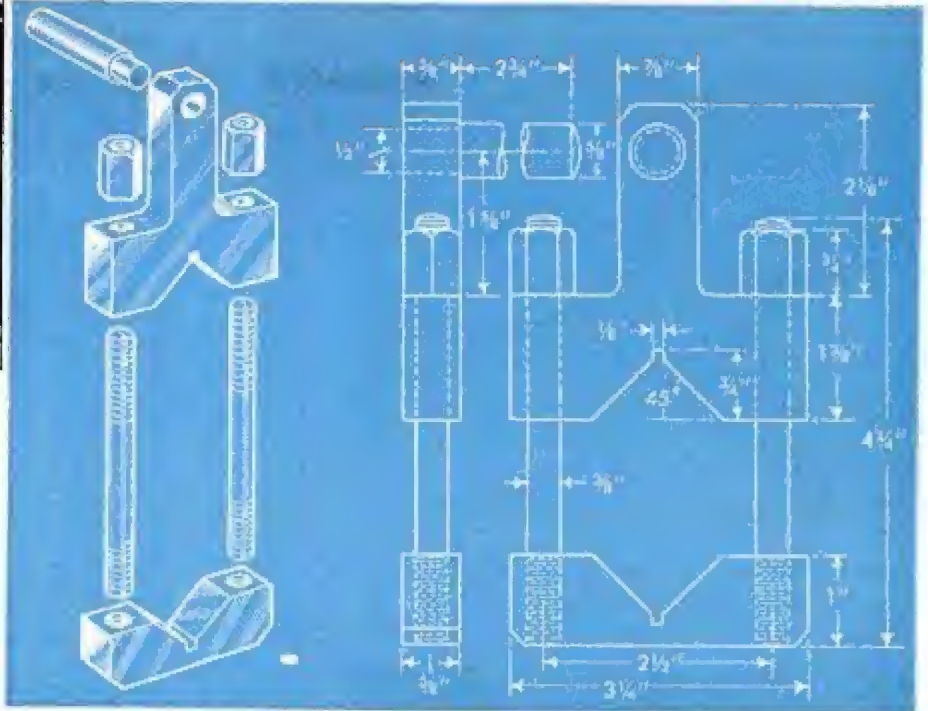
C. W. Woodson, Miami, Fla.



Make Your Own Lathe Dog



FOR THE metalworker who enjoys making his own lathe accessories more for the experience gained than an actual saving over the price of a commercial item, here's a simple lathe dog that can be made from scraps of steel usually found around the shop. Being adjustable, the dog will accommodate both round and square work from 1 in. up to 2 in. in size. The main body and movable jaw are cut from $\frac{5}{8}$ -in. cold-rolled steel. The 45-deg. V-notch in both parts is machined at one time while the parts are clamped together in the shaper vise. Likewise, the holes for the clamping studs are drilled with the parts clamped together to assure accurate alignment. The holes in the body are reamed to provide a nice sliding fit over the studs.



The driving tail which fits the faceplate slot, is turned from $\frac{5}{8}$ -in. steel rod and shouldered at one end for a drive fit in the body. Two locknuts, $\frac{3}{4}$ in. long, are used to cap the ends of the studs. If desired, these may be made from $\frac{5}{8}$ -in. hexagon steel rod, center-drilled and bored before threading with a $\frac{3}{8}$ -in.-16 tap. The studs are cut to length from $\frac{3}{8}$ -in. drill stock and threaded at each end. When tightening the dog, draw both nuts to the same tension.
C. W. Woodson, Chicago.

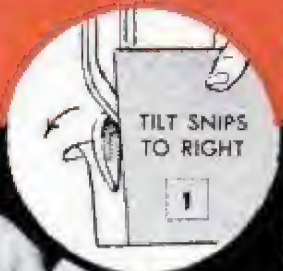


Livestock Loading Chute Adjusts to Any Height

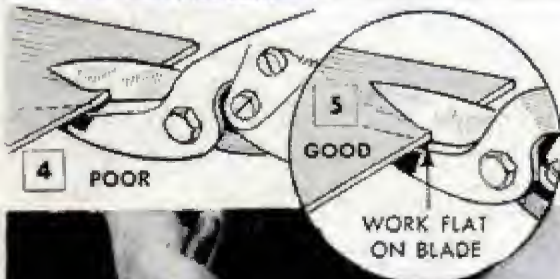
A farmer's cooperative built this special loading chute to speed up the sorting and loading of livestock into trucks. As pictured, the original was built in a corner of the sorting yard and is permanently housed in a roofed structure open at both ends. The lower end of the chute, or ramp, is pivoted so that it can be raised to any truck-bed height by means of a hand-operated windlass. A ratchet and dog on the windlass drum locks the upper end of the chute at any height. When the truck has been backed into position and the chute raised, covering boards, or tread plates, hinged to the top end are turned over to bridge the gap between the end of the truck bed and the chute, thus preventing injury to the animals. A counting gate is hinged to the lower end of the chute. Many farmers in the community served by the cooperative have built smaller chutes of the same design for loading hogs and sheep at the farm.

HOW TO CUT

Sheet Metal



Snips should be held square with work, except aviation type which cut best with right tilt. Below, vise mounting aids in cutting thick stock

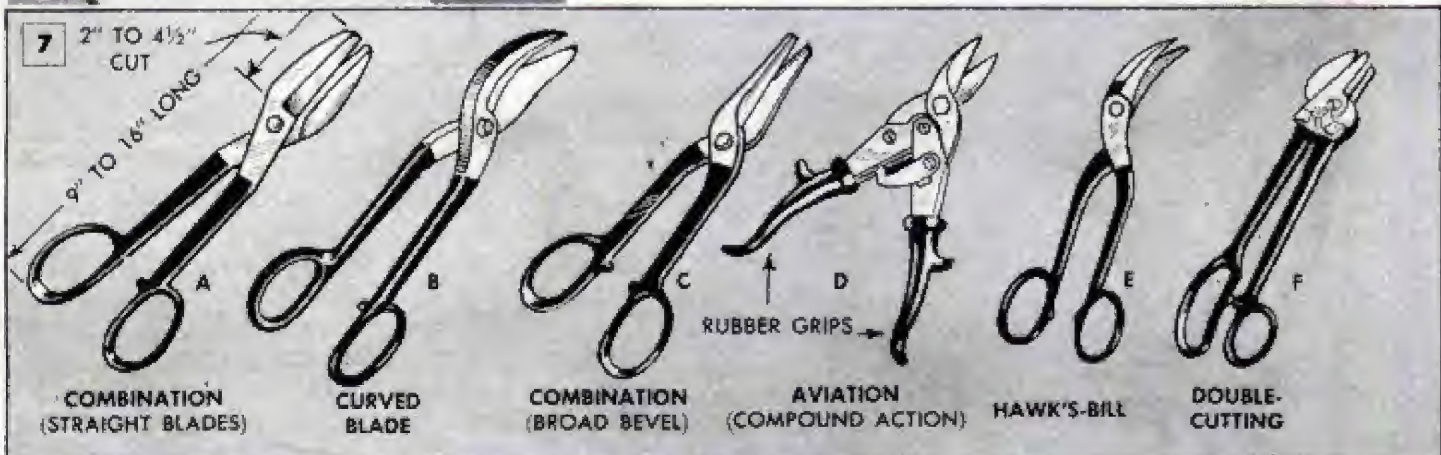


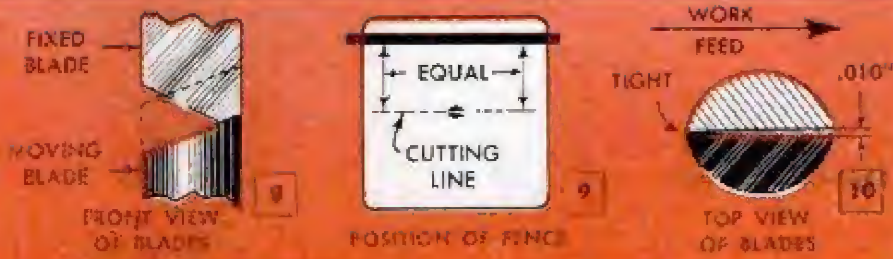
JUST AS IN woodworking, the fundamental process in working with sheet metals is cutting the stock to specified dimensions or shapes. In some instances, such as making ornamental cutouts and plain overlays, the whole job is confined to cutting operations, but more often cutting is simply a preliminary step to bending, spinning, hammering and other operations needed to complete the project.

Snips are basic tools: Whatever other sheet-metal cutting tools you may have, there is always need for a pair of snips. Several popular styles are shown in Fig. 7, of which the combination snips, A and C, are favorite all-purpose tools for straight or curved cutting. Aviation-pattern snips with compound leverage are rapidly gaining in popularity. These snips make a clean cut with much less hand pressure than required for regular snips. When using snips, the blades should be held at right angles to the work, as shown in Fig. 2. If you run off the line, a slight tilt to the right, Fig. 1, will free the work pressure and allow the blades to return to the line.

Snips with a broad cutting bevel, C and D, Fig. 7, work best if tilted a little to the right throughout the cutting operation. Fig. 5 shows how the right tilt locates the lower face of the work flat on the blade. When cutting heavy materials with snips, a one-handed action with the free handle held in vise, Fig. 3, will give extra power.

Slitter and portable shear: These two are power tools and both work on the same principle, having one fixed and one moving blade, as shown in Figs. 8 and 13. The slitter is a bench tool. In a small unit, it is powered with a 1/4-hp. motor which is belted to the machine with driving and driven pulleys of the same size, giving 1725 strokes per minute. It is a fast-cutting machine



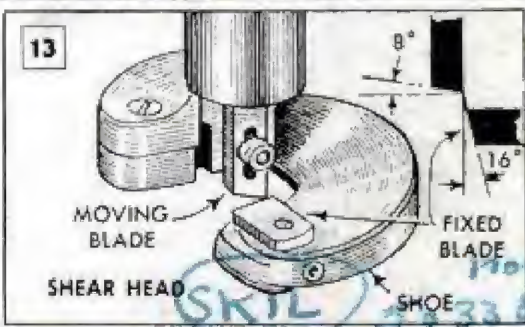


SLITTER AND PORTABLE SHEAR are fast cutters. Both work on the same principle, each having one fixed blade and one moving blade

when properly operated but requires some practice in manipulating the work and adjusting the blades. The blades will cut best if set tight on the infeed side and slightly open at outfeed side, as shown in the top view, Fig. 10. The feed rate should be smooth and uniform and the operator must guard against any tendency to lift the front edge of the work as this will invariably cause jamming.

It is practical to fit a plywood table over the regular metal table and in this way gain needed work surface for large pieces. Although straight cutting with a fence is fast and accurate, it is important that the fence be set parallel with the flat side of the blades, Fig. 9. If the fence is only slightly out of line, the work may jam.

The cutting head of the portable shear is detailed in Fig. 13 and the shear is pictured in Fig. 14. This is a convenient, fast-cutting tool and the most important point in operating technique is to keep the work flat on the fixed blade. It will make inside cuts but requires a rather large hole in the stock to admit the shoe. Neither shear nor slitter is capable of

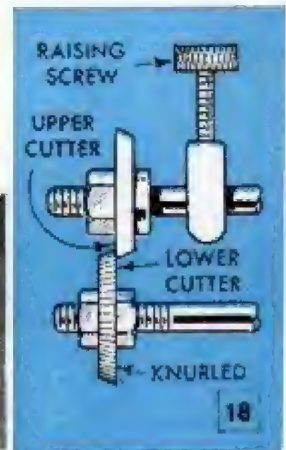
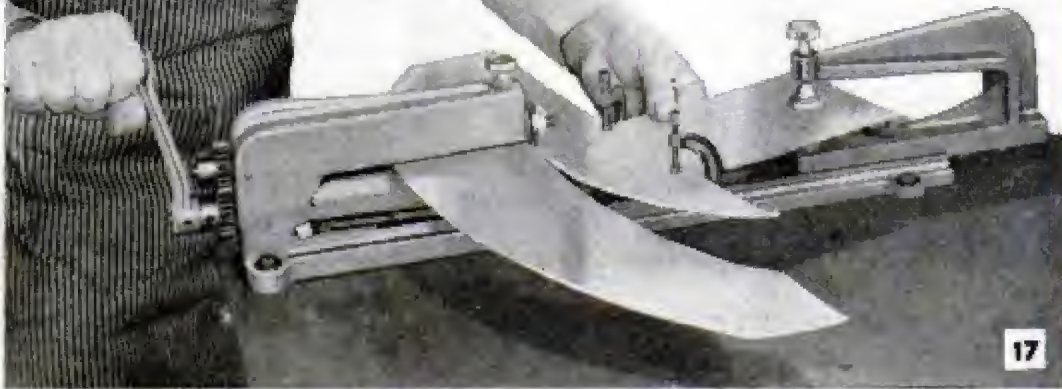


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Tool Data	SNIPS	SLITTER	PORTABLE SHEAR	PORTABLE NIBBLER	HAND PUNCH	RING SHEAR	BAND SAW	JIG SAW
THICKNESS CAPACITY	21 GA. (.032")	20 GA. (.035")	18 GA. (.049")	18 GA. (.049")	20 GA. (.035")	20 GA. (.035")	ABOUT 3"	ABOUT 1/4"
CUTTING SPEED per Min.	ABOUT 24"	UP TO 120"	UP TO 120"	UP TO 80"	UP TO 40 STROKES	UP TO 120"	UP TO 120"	ABOUT 30"
MINIMUM RADIUS	ABOUT 3/4" (AVIATION)	ABOUT 3"	ABOUT 3"	ABOUT 2"		ABOUT 3/4"	1/2" (3/8" BLADE)	WILL MAKE ANY CUT
KIND OF WORK	GENERAL	GOOD FOR FAST ROUGH WORK	GENERAL	STRAIGHT AND CURVES - GOOD FOR NOTCHING	HOLES AND SHORT STRAIGHT CUTS	GOOD FOR CIRCLES AND RINGS	GENERAL-FAST CUTTING	INTRICATE CUTOUTS--INSIDE CUTS



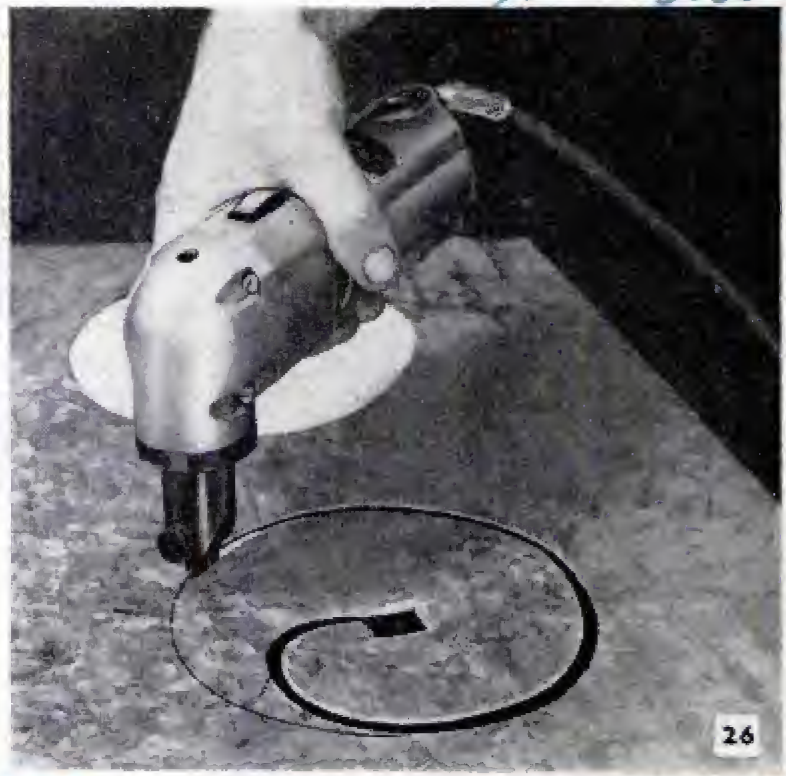
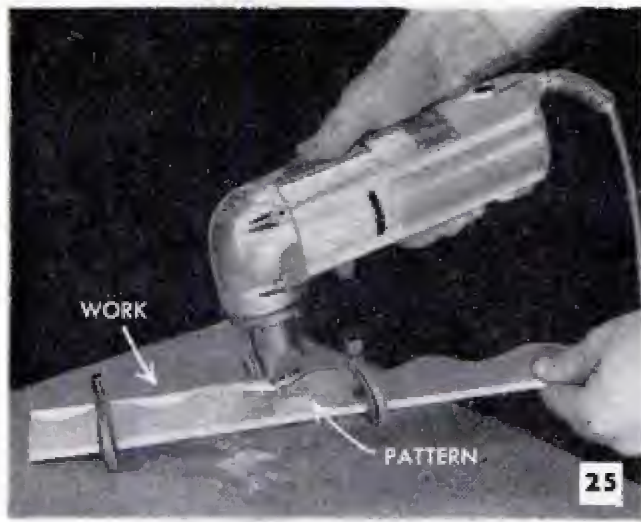
Ring shear does perfect circle work needed for plates and lamp shades. Photo below shows extension strip clamped to work to provide a pivot for swinging large segment



Circles are cut by using a pivot, which is an accessory to the shear. Cut may be started at edge of work, as in bandsawing, or top cutter can be forced through work at any point. To prevent distortion, inside cuts are made with minimum overlap of the cutters. On outside cuts, snip away the waste as cut progresses



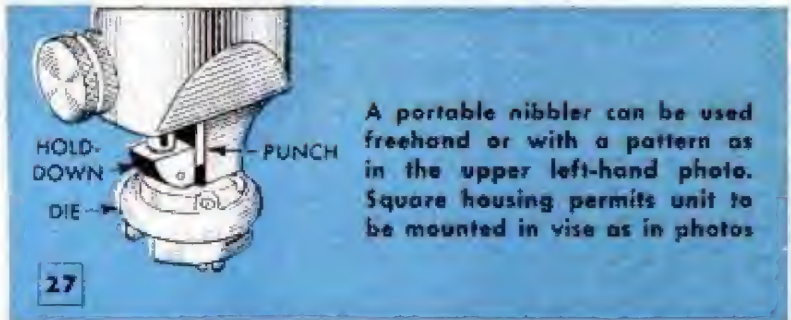
Straight cuts can be made freehand by following a pencil line, but a better way is to improvise a guide as in left-hand photo. Center photo shows how notches are cut to form box corners. Right-hand photo shows how a curved guide can be used to form a true radius. In this case, an ordinary washer served the purpose



making sharp curves. Such work must be done by making a series of tangent cuts to the dimension line and cutting away the waste.

Ring shear: One of the best tools for cutting sheet metal is the ring-and-circle shear, Fig. 17. It cuts fast, is noiseless and does perfect work in cutting circles and rings needed for many metal projects. Fig. 18 shows the cutting head, consisting of two hardened steel wheels which are interchangeable. The knurled wheel will leave a slight track on the work but the interchangeable feature permits mounting this wheel to run on the waste stock.

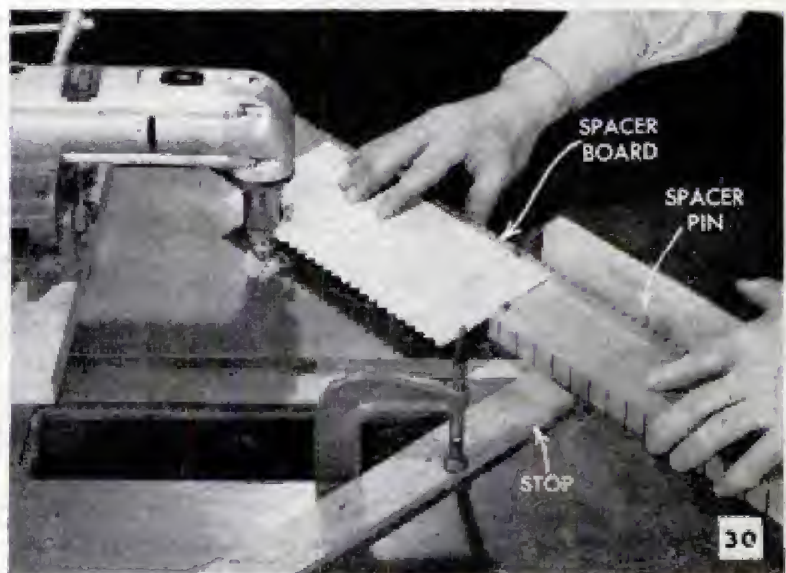
When cutting a circle, the work is clamped in the pivot jig, after which the raising screw is turned to force the cutter through the work, Fig. 19. After that, you just turn the crank. It usually is advisable to cut away the waste, or off-fall, in sections, Fig. 20. Inside cuts are made in the same manner, as shown in Fig. 21. When used with the guide, Fig. 22, the ring shear



A portable nibbler can be used freehand or with a pattern as in the upper left-hand photo. Square housing permits unit to be mounted in vise as in photos

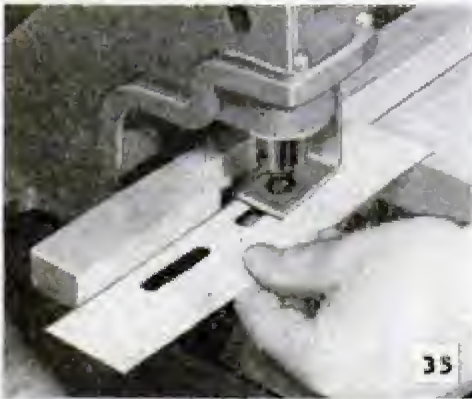
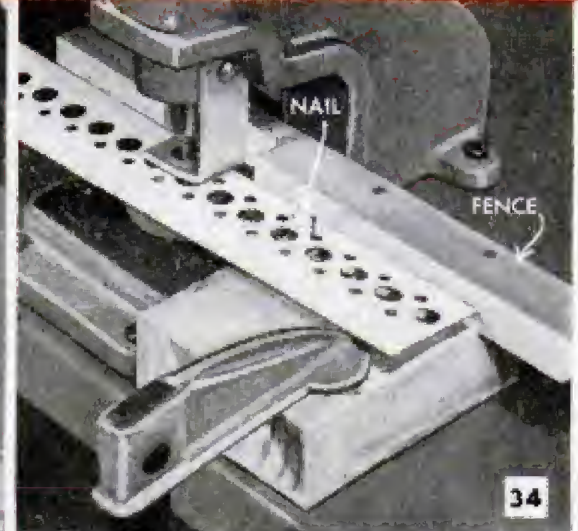
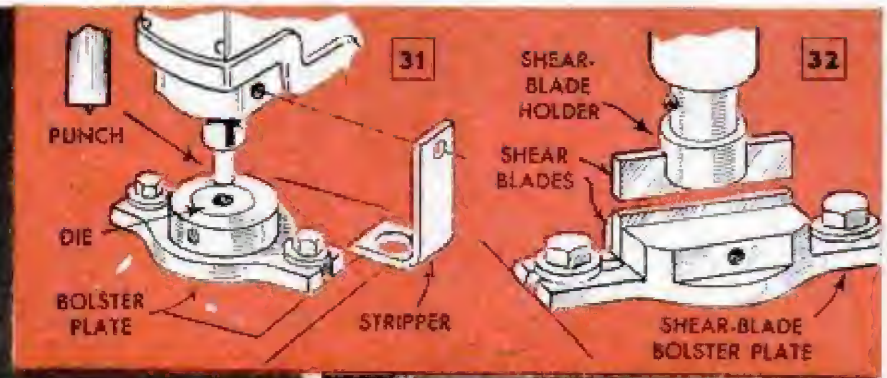


Used with a spacer board and stop on circular-saw table, the nibbler can be set up to make a variety of attractive notched borders. Work is held in place with thumbtacks





Hand-operated punch makes clean, round holes for rivets or decorative effects. Square dies are available for certain type punches, also accessory shear blades in various sizes



A hand punch does accurate slotting



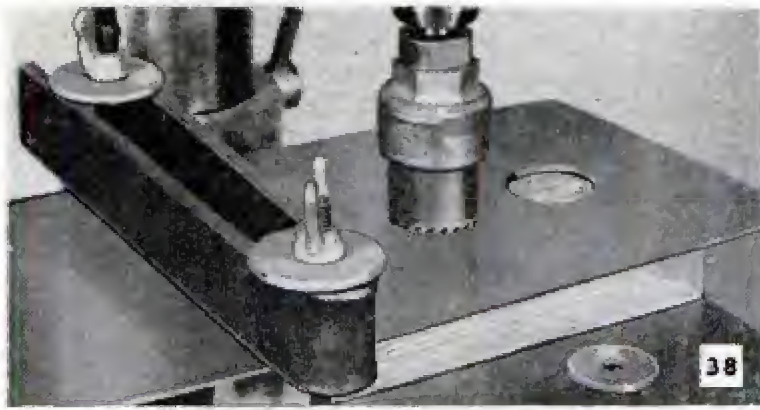
Above, cutting in from edge with shear. Below, notching edge with shear blade



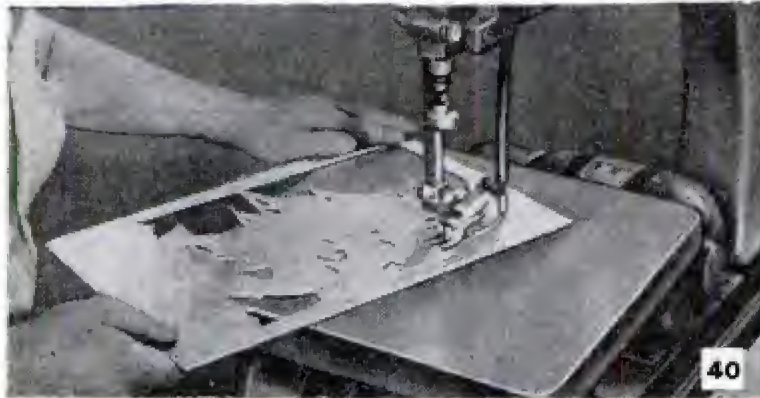
does clean, straight cutting. Fig. 23 shows a notching operation and Fig. 24 shows how a pattern can be used. In this instance a washer serves as a guide for rounding corners.

Portable nibbler: Punching tools, which include the nibbler, Fig. 26, and the hand punch, Fig. 33, work with the least distortion of the material and make the cleanest edge of all metal cutters. The portable nibbler is simply a power-operated punch. As shown in Fig. 27, the die is carried on an extension of the frame, while the punch oscillates rapidly up and down through the die. In the portable tool, the most popular type of punch is a rectangular shape measuring $\frac{1}{16} \times \frac{1}{4}$ in., with rounded edges. The slight serrations left by this type of punch are so small that the edge requires a minimum of finishing. Because of its easy portability, the nibbler is widely used in cutting large patterns and cutouts on sheet sizes which are impractical to handle on a bench machine. But it does the smaller, more intricate jobs equally well. Cutting without distortion and with no exposed parts, it will work circles down to the size of a dime. Inside cuts can be made with a 1-in. starting hole, as in Fig. 26. The use of a metal or wood pattern is practical and fast repetitive work can be done in this manner, the edge of the cutterhead riding the pattern as in Fig. 25. Many portable nibblers have a square motor housing to permit vise mounting. A good setup of this kind can be made on the circular-saw table, as shown in Fig. 28. With the work thumb-tacked to a spacer board, the saw-table setup is ideal for ornamental notching, as shown in Figs. 29 and 30.

Hand-operated punch: This is one of the handiest tools in the shop and does a variety of jobs with suitable accessories. Its prime job is to punch round holes in sizes from $\frac{1}{8}$ to $\frac{1}{2}$ in., advancing by sixteenths. Fig. 31 shows the setup. Each punch has a tiny point at



Hole saw is useful drill-press accessory for cutting clean holes. Also is used with portable drill



Jigsaw is best for intricate cutouts in sheet metal. A 15-tooth blade does rapid work in medium stock



Bandsaw used as friction saw cuts fast and accurately on sheet metals of all kinds up to 1/8 in. thickness

the center, and this centers on punch marks made on the work. Instead of prick-punching each center mark, it is possible in repeat patterns to use a fence and guide pin, as shown in Fig. 34. After the first 4 in. of the pattern have been punched out in the usual manner, succeeding holes can be worked very rapidly. Employing a series of punched holes with the work guided along a fence, the hand punch does excellent slotting, as shown in Fig. 35. Unlike a similar operation done with drills on the drill press, the holes can be as closely spaced as desired, without distortion or runover.

A handy accessory for the hand punch is a set of shear blades, Fig. 32. With these you can do straight-line cutting, notching and internal cutting. The shear-blade bolster plate can be used in either of two positions, as shown in Figs. 36 and 37, to suit the work.

Bandsaw and jigsaw: More familiar to the average worker, these power tools do excellent work in metal. Ordinary wood or metal-cutting bandsaw blades run at woodcutting speeds can be used to cut aluminum up to 1/16 in. thick. For fast cutting of heavier black and galvanized sheet metal up to 1/8 in. thick, the technique of friction sawing on the bandsaw is excellent. This is done with a regular metal-cutting blade, 18 teeth per inch, run at 2800 to 3000 f.p.m. Galvanized sheet stock can be cut in this

way as fast as the hand can push the work, Fig. 39. For conventional bandsawing of sheet metal, the speed should be reduced to approximately 200 f.p.m., using a 24 or 32-tooth blade.

The jigsaw cuts much more slowly than the bandsaw but is the best tool for making intricate cutouts involving short-radius curves. The fastest cutting is obtained with a hardened and set metal-cutting blade with about 15 teeth per inch. For finer but slower work, 30 or 32-tooth blades should be used. Medium speed can be used for soft metals. But use only the slow speeds for sheet steel.

Other equipment: The tools described fall far short of covering the full line-up of sheet-metal cutting tools. A worth-while extra is a set of hole saws, which can be used in an electric portable drill or drill press, Fig. 38, for cutting accurate holes in sheet metal. Of the various methods, snips, ring shear and punch are the 1-2-3 selection—assuming that you already have jigsaw and bandsaw. ★ ★ ★

Tapping Holes in Sheet Metal

Tapped holes in sheet metal will grip screws more securely if the metal is punched instead of drilled. The use of a prick punch forms a burr which produces a "thickness" several times that of the metal itself, thus accommodating additional threads.

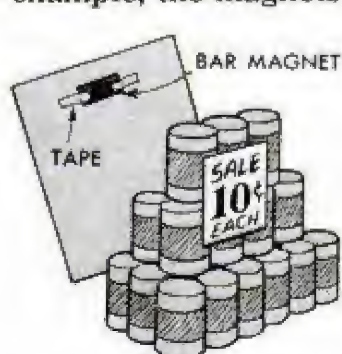
Sectional-Type Door in Granary Provides Lighted Work Area



Wanting a comfortable place where he could do such jobs as repair farm equipment and grind feed regardless of the weather, one farmer utilized the driveway of his granary by installing a sectional door in which several rows of plywood panels had been replaced with glass. Being glazed, the door can be closed in stormy weather and still provide ample light for working.

Magnets Support Price Cards On Merchandise Displays

Small bar magnets taped to the backs of price cards will make it possible for the cards to be attached quickly to a display of foods or other products in tin cans. The same idea can be useful in many ways. For example, the magnets are ideal for mounting



display cards or other information on home appliances such as refrigerators and stoves, as well as on tools and metal equipment. — Leonard W. Mitchell, St. Clair Shores, Mich.

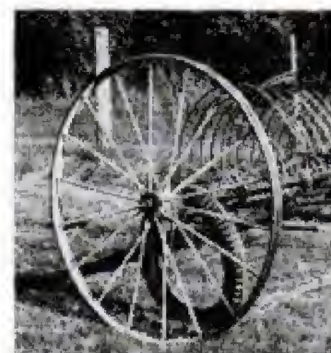
Salvaging Scaffolding Lumber

Finding that a large percentage of the lumber used for scaffolding was badly damaged by hammer blows while being dismantled, one contractor supplied his workmen with lengths of sand-filled rubber hose to knock down the scaffolding. Use of the hose for this purpose distributed the force of the

blows across the surface of the boards so that splitting and splintering of the wood was practically eliminated. He utilized ordinary garden hose which was cut into sections about 18 in. long. After filling the hose with sand, the ends of the sections are plugged with corks or wooden dowels. The plugs are held in place with nails driven through the sides of the hose and into the plugs.

Wheel-Hub Guards for Hayrake Made From Old Tire

Halves of an old tire that have been placed over the axle next to the wheels of a hayrake will help keep hay from wrapping around the wheel hubs. First, the tire is cut in half around its circumference and then each section placed over the axle with the rounded side facing the wheel. — Clinton Hull, Costa Mesa, Calif.



Moldboard Extensions Roll Furrows During High-Speed Plowing

As an aid in plowing under heavy trash and cover crops, and also in preventing ridging of loose soils when plowing at higher speeds, many farmers equip tractor plows with moldboard extensions, or wings, bolted to the outer ends of the moldboards. The top edges of the extensions are bent so that when in place they incline slightly forward as pictured. In this position the extensions catch the top, or land edge, of the furrow as it is turned by the curved moldboard and "flip" it completely over. In high-speed plowing this action prevents ridging caused by soil being thrown on top of that turned by the preceding furrow, and also buries loose surface trash effectively and uniformly.





LAND LEVELER

By L. H. Houck

TRUCK FARMERS and others who require a perfectly level seedbed make extensive use of a land leveler when preparing the soil for planting. Levelers also are used to face terraces, build up low spots as well as fill and level dead furrows and back furrows in large plowed fields. The unit pictured was built in a farm shop and consists of an angle-steel frame of the truss type, welded at all stress points and fitted with a tubular-steel drawbar. Trailing wheels of large diameter are mounted at the rear end of the frame on a tubular axle. These carry the scraper blade at a uniform height and permit easy transport from field to field. The blade consists of a $\frac{1}{4}$ -in. steel plate, 6 in. wide and 8 ft. long welded to a length of 2-in. angle which extends the full length of the blade along the lower edge. The blade is bolted to the frame in a



vertical position and at right angles to the direction of travel. The photo above pictures the screw adjustment for raising and lowering the blade. Turning the T-handle raises or lowers the forward end of the frame and adjusts the blade to the desired height for work or transport.

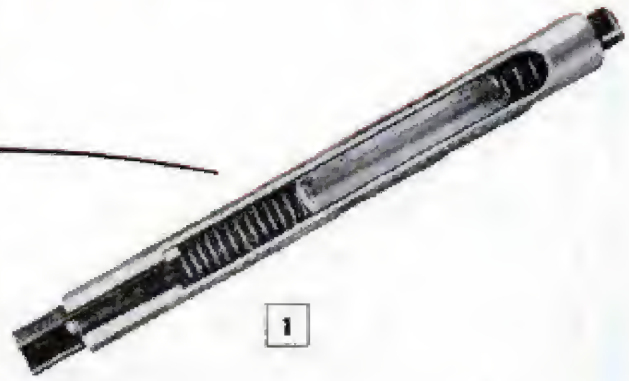
Paint Roller Spin-Cleaned by Chucking in Electric Drill

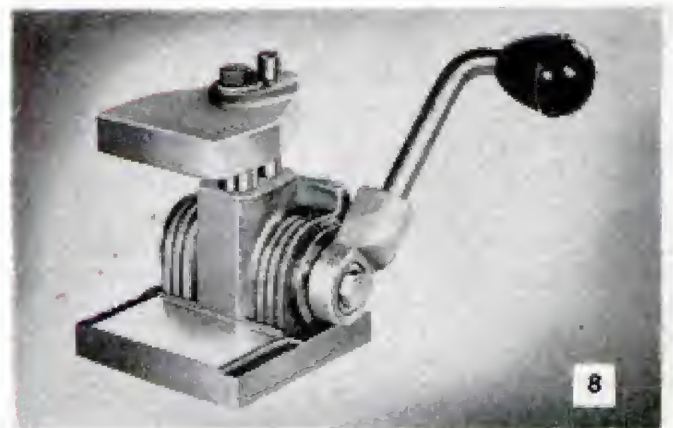
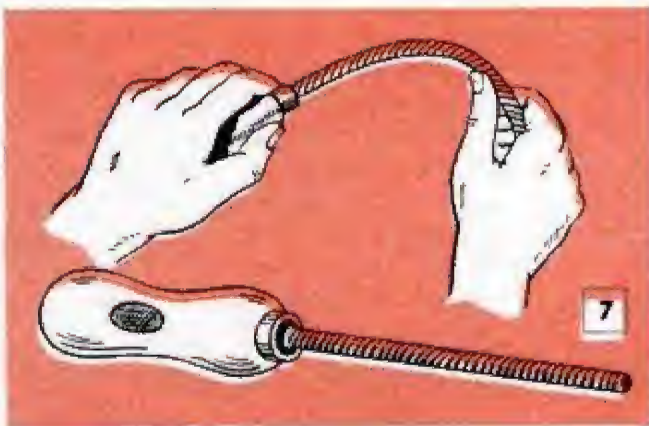
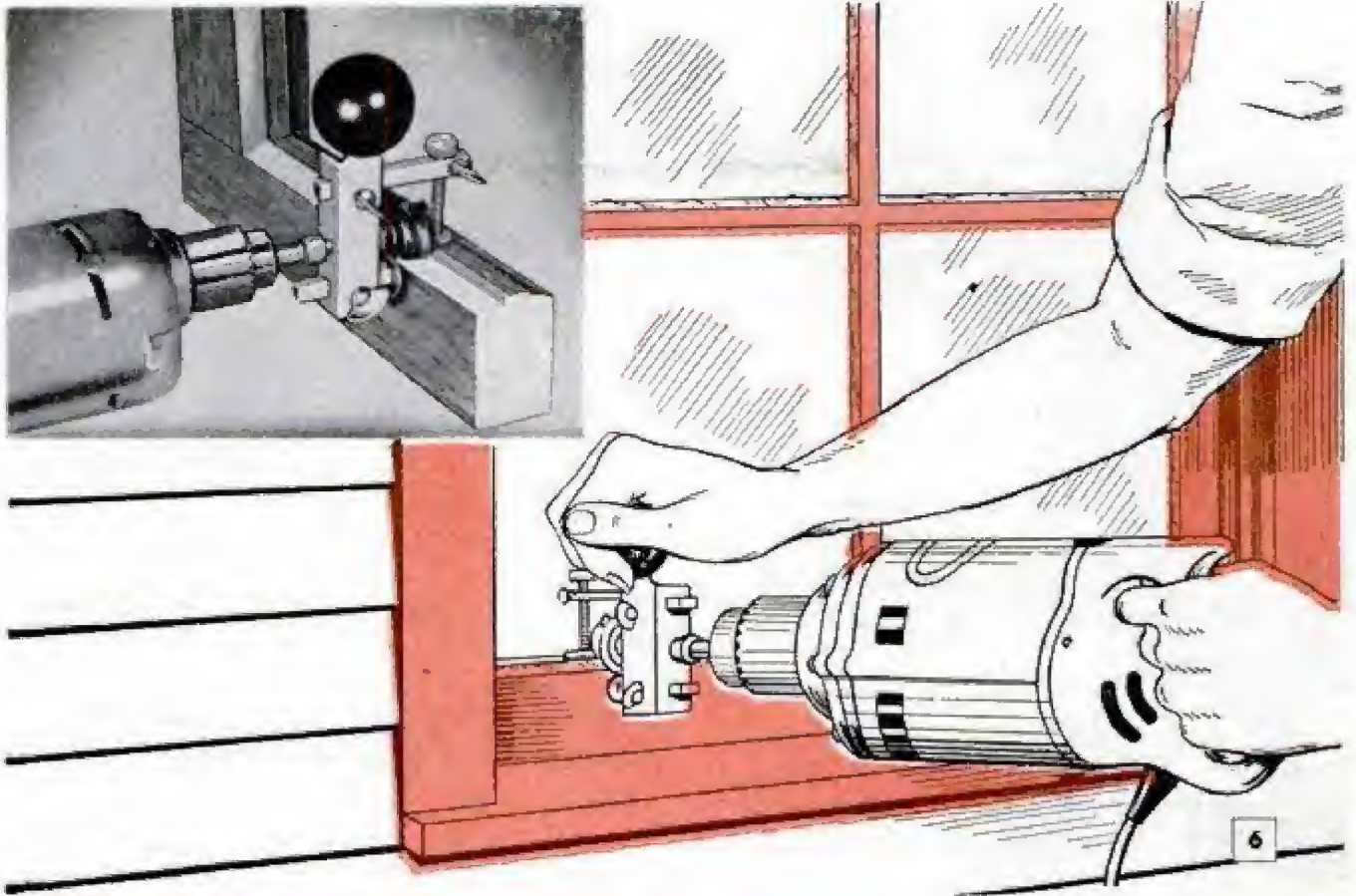
Seeking a means of cleaning a paint roller quickly and thoroughly after soaking it with solvent, I eventually hit upon the idea of adapting the roller so that it could be spun at high speeds in a portable electric drill. First, I removed the shaft from the roller and replaced it with a snug-fitting bolt that was long enough to extend a couple of inches from one end of the roller. Then I turned a nut on the threaded end of the bolt and tightened it against the end of the roller. Before chucking the bolt in

the drill, I obtained a bucket in which the roller could be spun, and also a piece of cardboard for covering it. After cutting a hole in the cardboard, I inserted the roller and turned on the power. In a matter of minutes both the paint and solvent had been thrown from the roller and deposited against the sides of the bucket. An otherwise messy job thus completed, I then removed the bolt and reassembled the roller and handle unit.

Dr. M. M. Thompson, Toledo, Ohio.

SHOPPING FOR TOOLS





1. MAGNETIC NAIL DRIVER enables lathers to fasten metal lath to concrete and other masonry materials without breakage and without endangering themselves and others with flying nails. Tool has magnetic core which holds nail in alignment as it is driven

2. COMBINATION SAW FILING AND JOINTING JIG permits hand filing and jointing of handsaw blades with accuracy and uniformity nearly equal to machine filing. Jig is equipped with a depth adjustment and bevel guide for holding file at the correct angle

3. ONE-DROP OILER has transparent plastic barrel and spring-loaded plunger which gives positive control of the amount of oil ejected at each plunger stroke. Plunger screws into barrel when not in use, preventing leakage of oil when carried in the pocket or kit

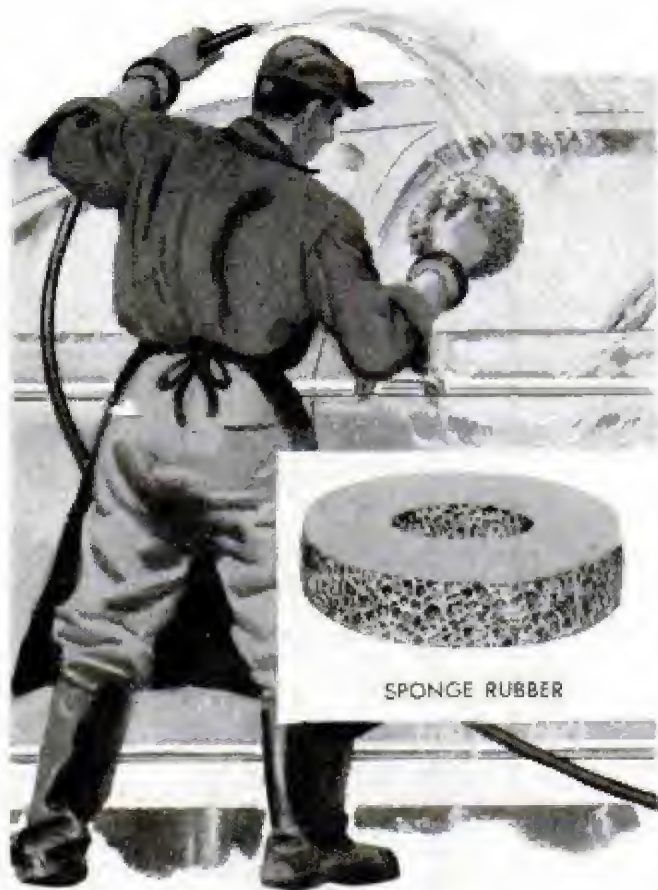
4. AIR-POWERED NUT RUNNER for small, precise work has standard deflection-type torque wrench that is easily removed for inspection. Especially designed for production jobs where precise torque control is essential to prevent distortion and breakage of small parts

5. TRUE-PITCH LEVEL makes it easy for plumbers and builders to determine the exact pitch of long runs of pipe and drain tile. Consists of two parts hinged at one end and provided with a locking-screw adjustment. A chart gives readings for various settings

6. PUTTY REMOVER is supplied as an attachment for a portable electric drill. Removes old putty from window sash, leaving a clean, smooth rabbet for reglazing. Depth and width of cut are controlled by a simple adjustment. Cutter is easily replaced when dulled

7. FLEXIBLE ROUND FILE cuts in any direction and can be bent to fit the contour of concave or convex surfaces. Special shape of the cutting teeth prevents clogging in soft, hard-to-file metals such as lead and soft aluminum. File is available in six sizes

8. SINGLE-POST DRILL JIG has a positive camming lock that reduces loading and unloading time to a matter of seconds. Base and top plate are accurately machined and the angle of back to base is milled at 90-deg. to permit unit to work in two positions



Wrist Guards for Car Washer

Resembling somewhat slices of pineapple from a can, these sponge-rubber drip guards can be slipped over the wrists to prevent water from running down the arms while washing a car. The pieces are cut from $\frac{1}{2}$ -in. sponge rubber and measure 5 in. in diam. Oval-shaped holes are cut so that they fit snugly over the wrists.

Oil Reservoir in Jaw of Steady Rest Lubricates Work Automatically

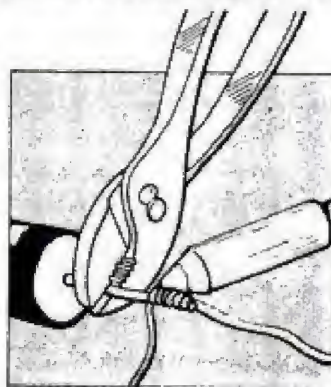
By providing an oil reservoir in the vertical jaw of your lathe steady rest, lubricant is fed to the work automatically. As shown in the detail, the reservoir is made by drilling a $\frac{1}{8}$ -in. hole lengthwise through the center of the jaw and is filled through an oilhole drilled at an angle at the upper end. A heavy oil should be used, of course, so that it does not run too freely from the jaw. In fact, the reservoir could be packed with grease or a special lathe-center lubricant, relying on friction to provide sufficient heat to cause the grease to seep downward and oil the work. Note in the detail that the hole running through the center of the jaw is chamfered slightly to help retain the oil at the point of bearing.

Richard Hanscom, Elmhurst, Ill.

❏ Instead of using special layout ink and scriber to make rough layouts on metal surfaces, one machinist has found that the job can be done much faster if a ball-point pen is used.

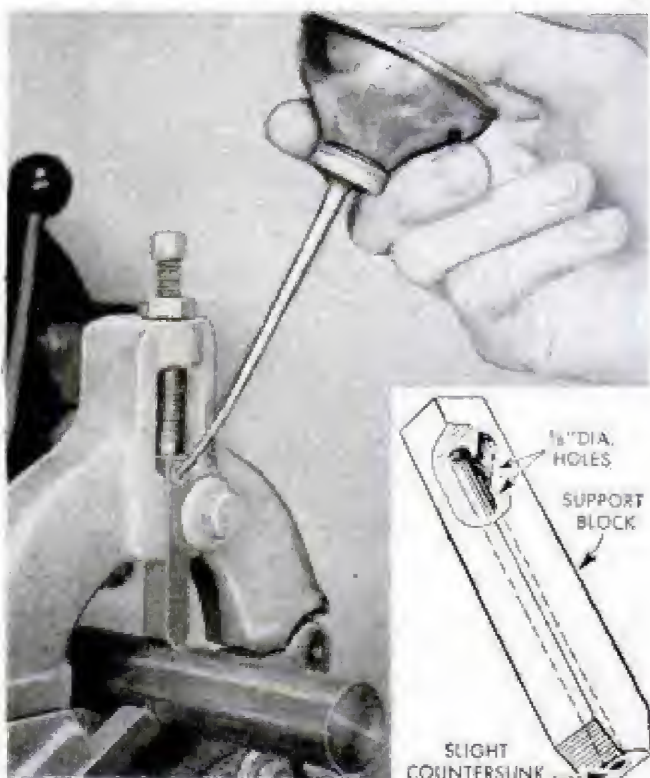
Pliers Protect Condenser When Soldering Leads

Considerable damage to condensers can be caused by heat from a soldering iron, particularly in instances where short leads are being soldered. To minimize the amount of heat that reaches the condenser, grip the bare wire between the iron and the condenser with a pair of pliers as indicated in the illustration. In this way, most of the heat will be absorbed by the plier jaws. — David Findlay, New York City.



Quick-Changing Restaurant Sign Mounted on Venetian Blind

Operating a small restaurant that ordinarily lists its menu and prices on a wall sign, one owner found that the time spent each day in changing the sign from luncheon to dinner prices could be saved by posting midday prices on one side of a Venetian blind and the evening prices on the other. This made it possible to effect the change in a matter of seconds by merely pulling the cord which reverses the position of the slats. Menu entries may be lettered on strips of drawing paper with ink or colored sign paints and then fastened to the slats with large paper clips or strips of tape.



RADIO LINKS FOR RURAL PHONES

EXPERIMENTAL USE of radio instead of poles and wires for some parts of rural-telephone systems was proposed by the Rural Electrification Administration to find out whether a radio link is more economical and efficient than usual installations in remote areas.

The Technical Standards Division of REA, in conjunction with General Electric, recently developed and completed the installation of such an experimental radio-telephone link for the Fredericksburg and Wilderness Telephone Co., Inc., Chancellor, Va. It interconnects the remote community of Alsop, Va., with the central office of the company at Chancellor, a distance of about 10 miles. The signalling and terminating equipment interconnects the radio circuit with the telephone-exchange equipment.

Directional antennas are installed on a wooden pole; similar equipment is installed at Alsop. One link in the system is shown in the photos. In photo A, the transmitting and receiving equipment is being hoisted into position outside the company's unattended central dialing office at Five Mile Forks, Va. Photos B, C and D show REA engineers checking the installation and sorting out the tubes by means of which 10 subscribers on a party line can dial their neighbors via the air waves or talk to any of 350 subscribers on the automatic system.



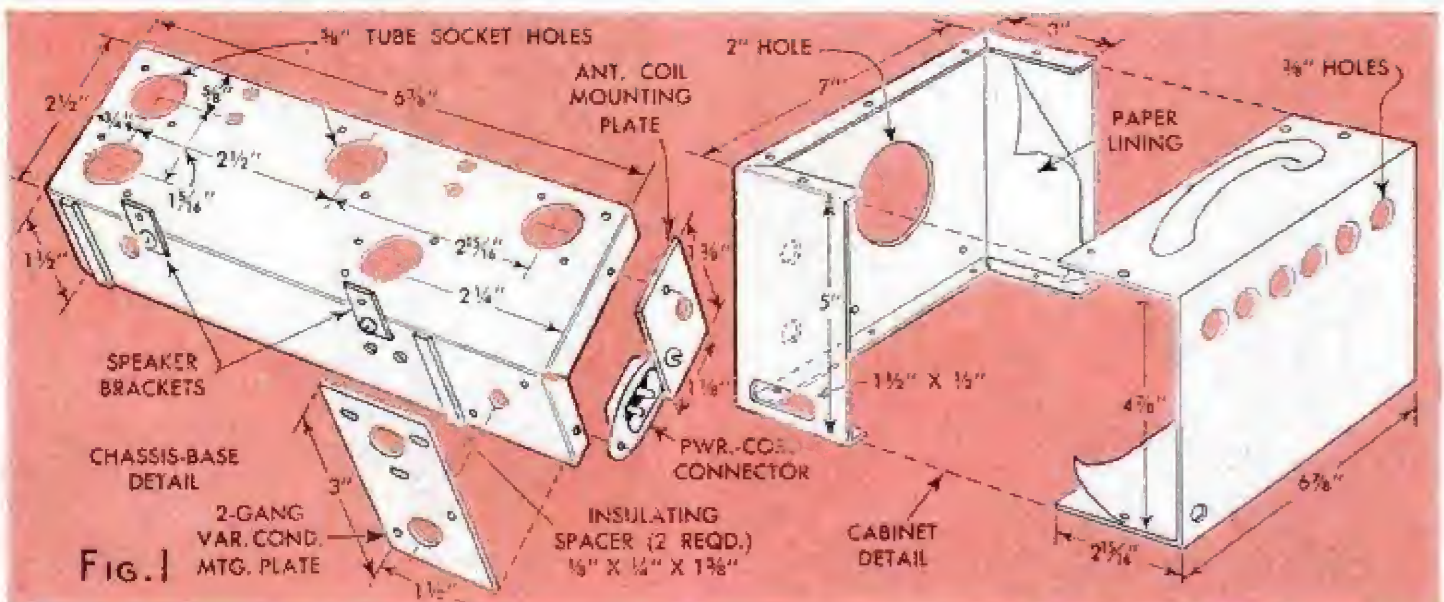
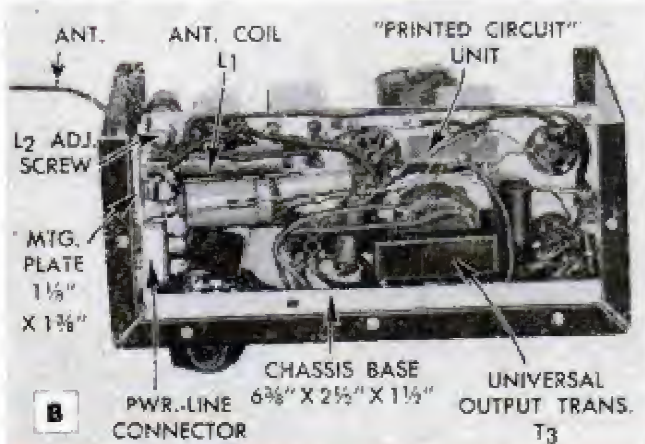
TINY SALESMAN'S PAL A.C.-D.C. SUPER USES "PRINTED

By S. A. Johnson



WHETHER you are an honest-to-goodness salesman—on the road most of the time—or a once-a-year vacation traveler, you will find this little set a real companion. It is a sensitive five-tube super broadcast receiver so compact that it takes up very little room even in a brief case, as illustrated in photo C.

The extreme compactness of the set stems from careful layout and the selection of the now readily available "printed circuit" unit, which is only $1\frac{1}{16} \times \frac{7}{8} \times \frac{1}{8}$ in. This Centralab Audet output stage is the equivalent of eight standard parts and provides both the coupling capacitors and resistors for that portion of the circuit. The PC-150 Audet unit, illustrated in Fig. 2, has seven numbered leads. Its position in the circuit diagram, Fig. 2, is indicated with heavy lines. The printed circuit is priced at 59 cents in current radio-parts catalogues. Another component part which makes this tiny set possible is a Grayburne "Ferri-Loopstick" iron-core antenna coil that eliminates the need for a bulky, conventional loop antenna. Only a 2-ft. wire is necessary. It boosts the sensitivity and signal-to-noise ratio, mounts in any position and is easily adjusted. Miniature-type tubes are employed in the conventional super-heterodyne circuit and these tubes are chosen so the filament voltages add up to 110, making it possible to eliminate a line-cord resistor. The detachable line cord and plug used is a TV-type power cord that merely plugs into the power connector shown in photo E. Photos A, B, C, D and F are various views of the completed receiver. They should be studied carefully before starting construction. The miniature i.f. iron-core transform-



CIRCUIT" IN AUDIO STAGE

ers provide easier adjustment for alignment than was possible with trimmers and padders. These midget i.f. transformers can be either Miller type 12-C1, 455-kc. input and 12-C2, 455-kc. output units or equivalent Meissner types. The oscillator coil is a Meissner universal-type No. 14-1040. Charts for terminal connections come with all of these coils. The speaker output transformer is an ordinary universal type with six taps on the secondary. A midget-superhet two-gang variable condenser (C¹² and C¹³) is employed. The capacity of the r.f. section is 10.5 to 364 mmfd. and the oscillator section is 7.6 to 132.6 mmfd. These are listed in radio parts-house catalogues for about \$1.25.

The chassis base detailed in Fig. 1 fits into the small metal cabinet, which is actually a "Flexi-mount" case measuring approximately 3 x 5 x 7 in., as shown in radio catalogues. If the builder wishes to make his own, the actual dimensions are given in Fig. 1. This plain aluminum case was given a coat of black crackle paint. The handle is an ordinary chrome-plated drawer pull.

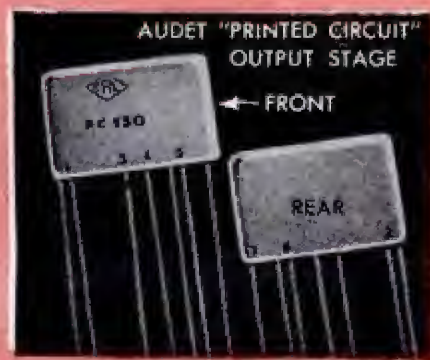
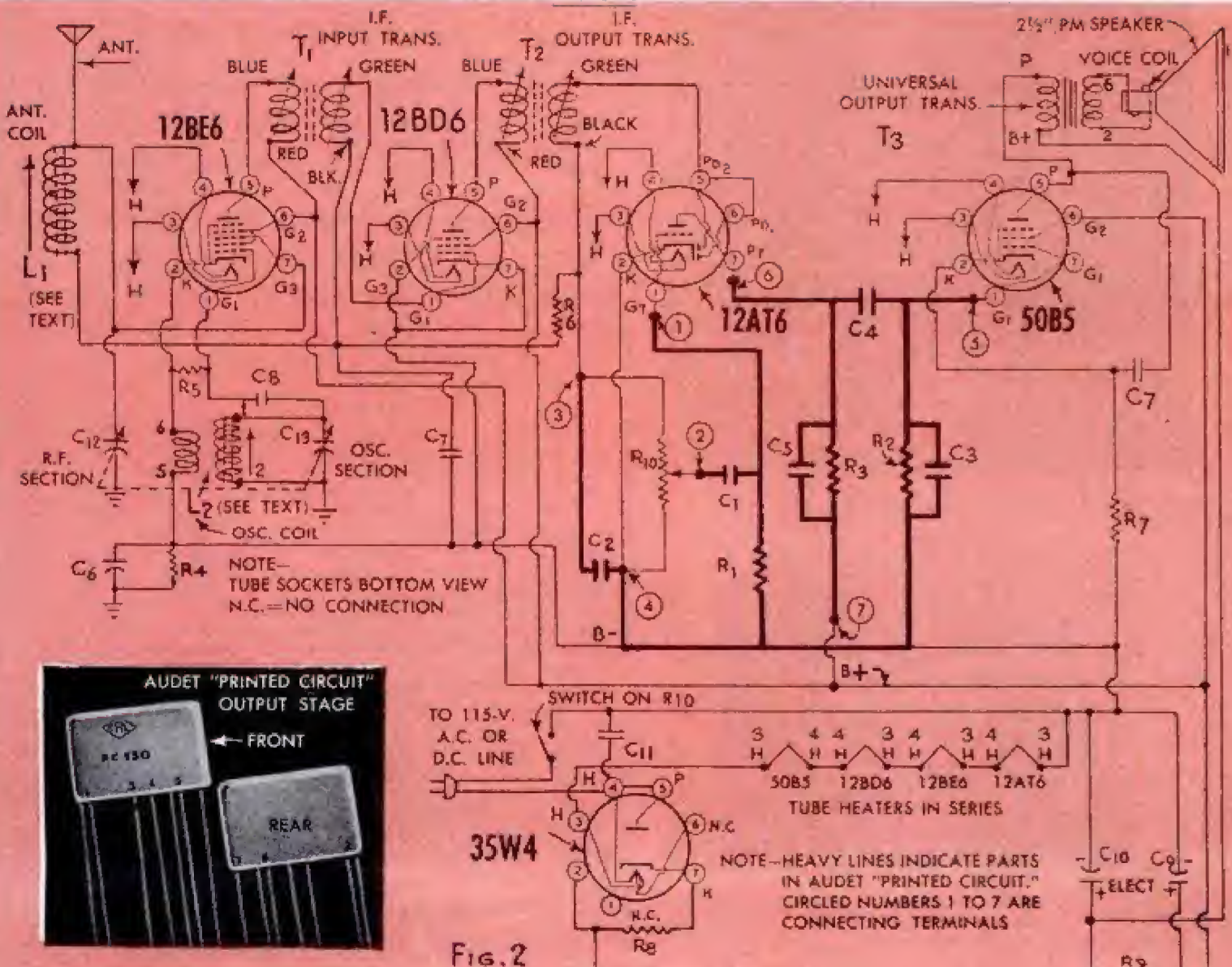
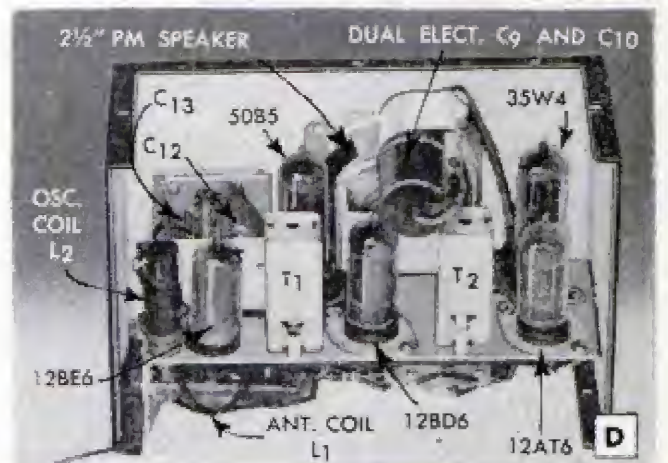
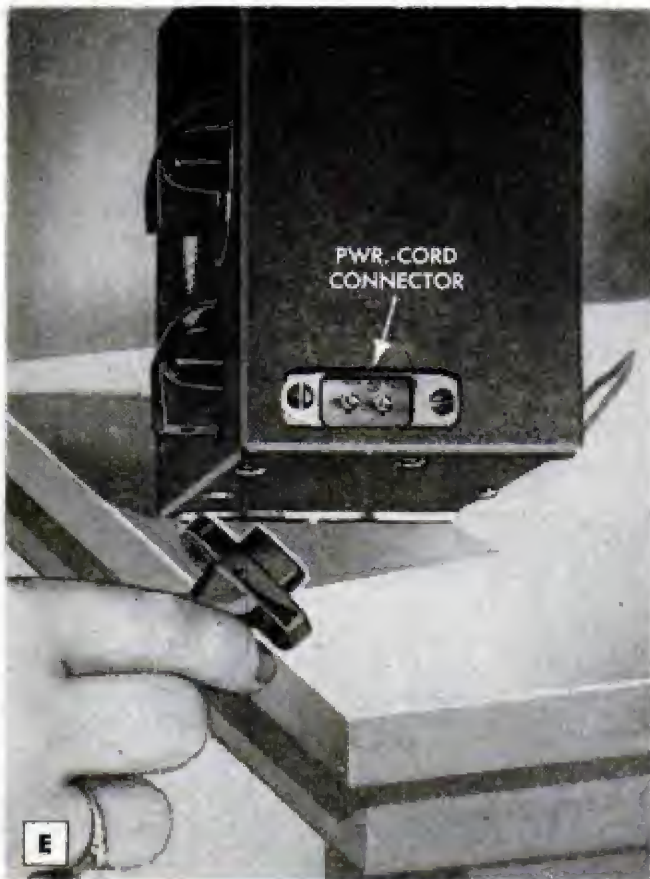


FIG. 2



E

CAPACITORS

- 1—2 MFD. 400-V. TUBULAR PAPER TYPE (C6)
- 1—.02 MFD. 400-V. TUBULAR PAPER TYPE (C7)
- 1—100 MMFD. CERAMIC TYPE (C8)
- 1—30 MFD. ELECTROLYTIC 150-V (C9)
- 1—50 MFD. ELECTROLYTIC 150-V (C10)
- NOTE—C9 AND C10 (IN A DUAL UNIT)
- 1—.05 MFD. 200-V. TUBULAR PAPER TYPE (C11)
- 1—2-SECTION MIDGET SUPERHET VARIABLE WITH 27-PLATE R.F. SECTION 10.5 TO 364 MMFD. (C12)
- 15-PLATE OSC. SECTION 7.6 TO 132.6 MMFD. (C13)
- NOTE—CAPACITORS (CONDENSERS) C1 TO C5 ARE IN THE AUDET TYPE PC-150 "PRINTED CIRCUIT" UNIT

RESISTORS

- 1—220,000-OHM ½-WATT CARBON (R4)
- 1—47,000-OHM ½-WATT CARBON (R5)
- 1—3.3-MEGOHM ½-WATT CARBON (R6)
- 1—150-OHM ½-WATT CARBON (R7)
- 1—27-OHM ½-WATT CARBON (R8)
- 1—1,000-OHM 1-WATT CARBON (R9)
- 1—1-MEGOHM MIDGET-TYPE AUDIO-TAPER VOLUME CONTROL WITH SWITCH (MALLORY MIDGETROL) (R10)

Although not difficult to build, this construction article is not intended for beginners. Because of limited space, the actual layout must be followed closely. Please note that only the variable condensers C¹² and C¹³, and capacitor C⁶, are grounded directly to the chassis base. The electrical "ground" (B-negative) is carried on a bare No. 12 bus-bar wire across the center of the chassis and is supported by means of two single-lug terminal strips. Terminal No. 4 on the printed circuit connects to this bus bar, also all other negative-B connections indicated in the schematic circuit, Fig. 2. This bus bar keeps the line voltage off the chassis base. As a further safety precaution, the cabinet is lined with light cardboard to eliminate accidental shorts. Use flexible insulated wire for the antenna.

To align the set, rotate the variable condenser with volume on full until you pick up a station with the condenser plates "closed" as far as possible. Next, adjust the iron core in the oscillator coil so the station falls on the dial at approximately the proper point for that station. If the set does not oscillate, reverse connections 5 and 6 on oscillator coil L². Now tune in a station at the high end (condenser almost open) and "peak up" that station by adjusting the iron core in the antenna coil. Always adjust the antenna coil with the 2-ft. flexible antenna wire attached. It should not be necessary to adjust the i.f. transformers as they are preset at the factory; any further adjustment should be slight.

The trimmers on the variable condenser are not used. They should be fully "opened." Detailed student material list R-412 is available from *Popular Mechanics* Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

Popular Mechanics

RADIO-TV and ELECTRONICS HANDBOOK

is written for millions of radio and TV-set owners, radio beginners, students and experimenters by Frank L. Brittin, Radio-TV and Electronics Editor of *Popular Mechanics*. You need no knowledge or experience to put the information contained in the book into immediate money-saving use.

Learn how you can install TV antennas, how to adjust and tune TV receivers, and how to make radio repairs and TV-tube replacements, eliminating unnecessary service calls.

Find out how you can build your own radio sets, amplifiers and many other useful electronic devices. There are complete instructions, detailed material lists and pictorial and schematic diagrams to guide you. Find out how you can join the ever-growing ranks of amateur radio "hams."

Over 500 photographs, drawings and diagrams illustrate the 160 fact-packed pages of the new second printing. Glossaries of commonly used radio and TV terms and color codes are included. Order your copy of RADIO-TV and ELECTRONICS HANDBOOK today from your local bookstore or send your order direct to Popular Mechanics Press. Price \$2.50.



F

HOMEMADE TV ANTENNAS

By John B. Ledbetter, W8YBG

UNLIKE ORDINARY broadcast-band roof-antenna systems, where almost any length of wire will bring in programs, TV antennas are critical in design as they must tune to the VHF (very high frequency) band.

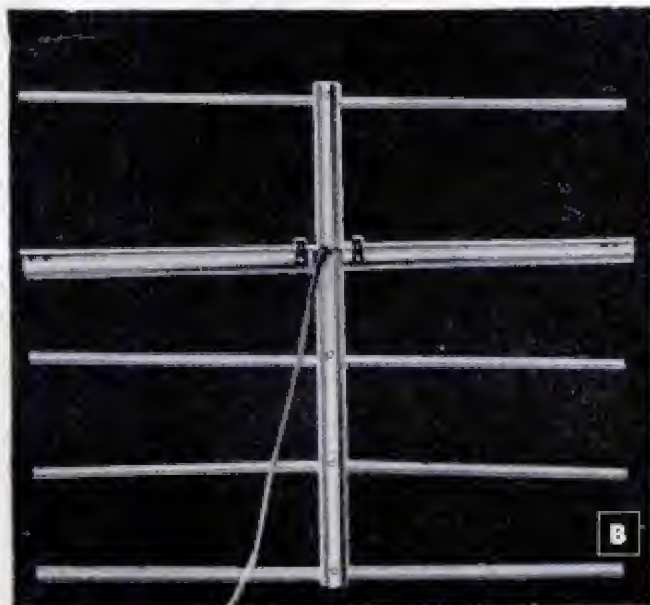
None of the commonly used VHF-television types are difficult to make if the set owner or experimenter has the necessary data for the length of the elements and the spacing between such elements. For a long time, radio hams have been making Yagi-type directive arrays with parasitic elements cut for their bands. It is one of the favorite TV receiving types today.

A very simple and seldom-seen type of TV receiving antenna is the loop variety shown in photo A and detailed in Figs. 1-A and 2-A. This type is quite directional and is effective in eliminating ghosts coming from the back or sides. Orientation is critical, but once it is properly adjusted for best reception, it will provide excellent pickup. A complete chart of dimensions for all VHF television channels is given for this loop. Although the loop will work best on the channel for which it is cut, it also may be used efficiently on several stations if they are located in the same general direction.

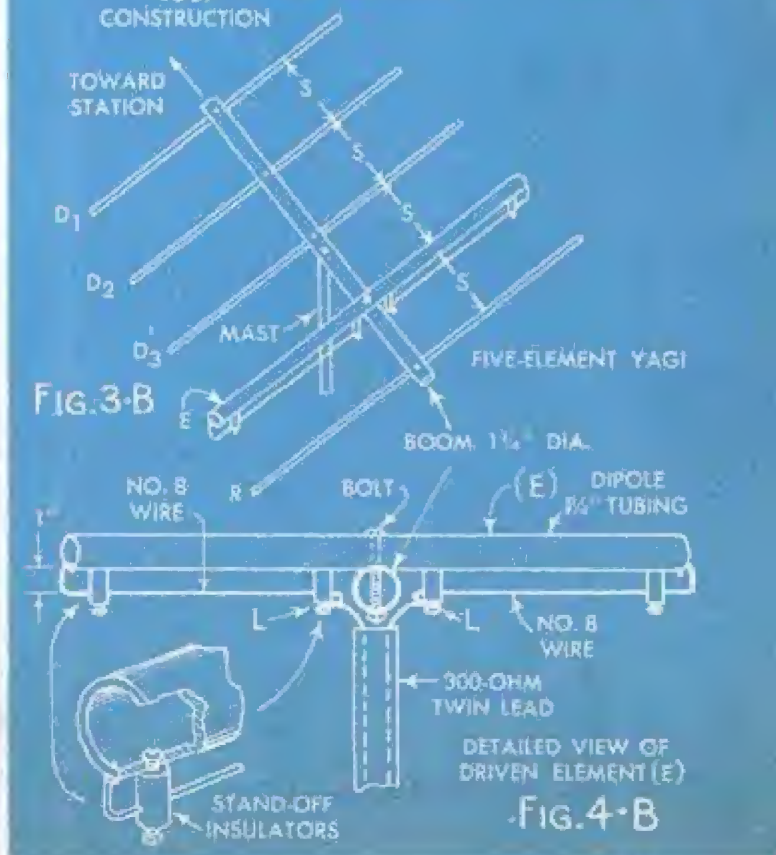
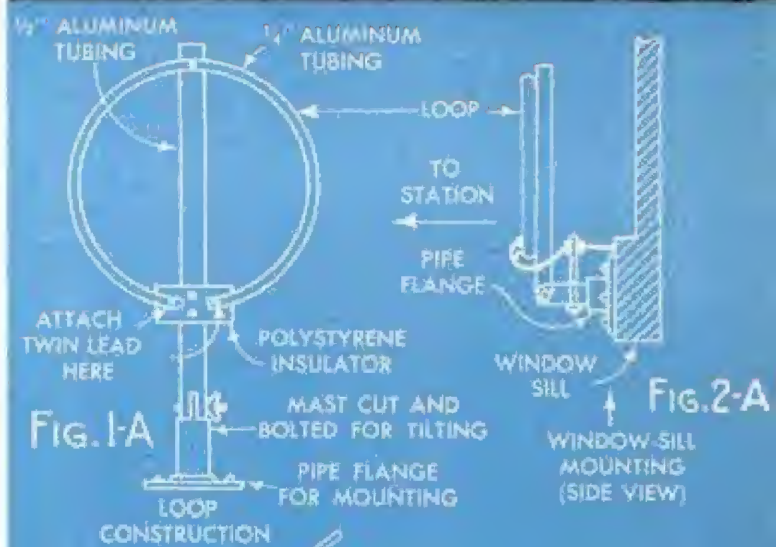
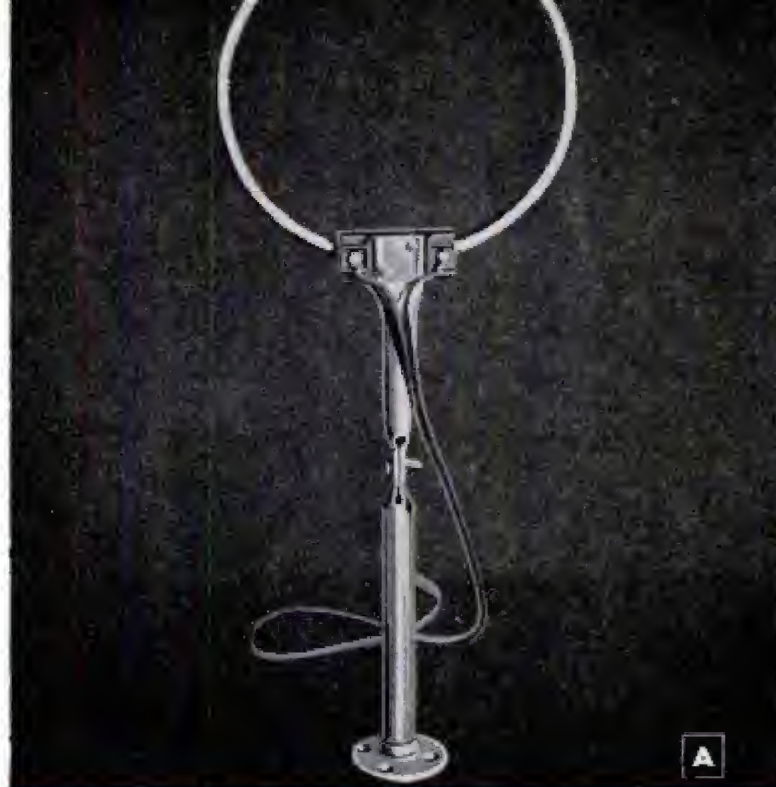
(Continued to page 232)

CHANNEL	INSIDE DIAMETER (inches)	TUBING LENGTH (inches)	CHANNEL	INSIDE DIAMETER (inches)	TUBING LENGTH (inches)
2	66	207	8	20	63
3	57 $\frac{3}{4}$	181	9	19 $\frac{1}{2}$	61
4	53	166 $\frac{1}{2}$	10	18 $\frac{3}{4}$	59
5	46	145	11	18	57
6	42 $\frac{3}{4}$	134	12	17 $\frac{3}{4}$	55
7	20 $\frac{3}{4}$	65	13	17 $\frac{1}{4}$	54

CHART FOR LOOP A
Tubing lengths for each channel



AUGUST 1952





A



B



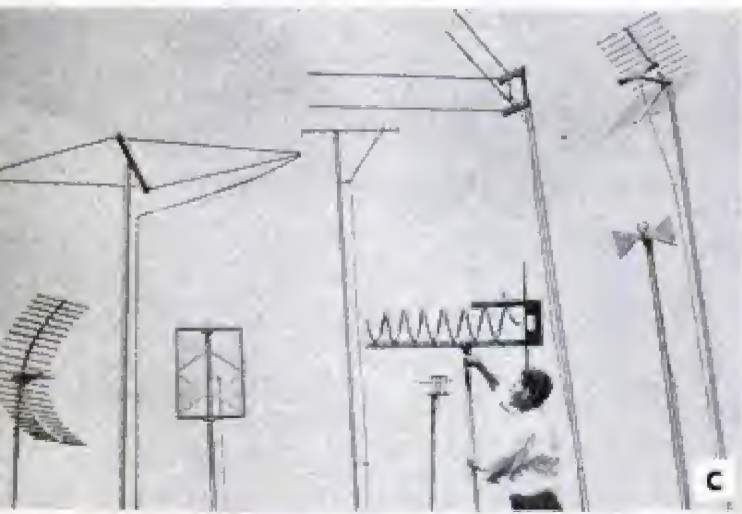
Radio, TV and Electronics Today

AMATEUR radio operator Andy Sannella W2AD, photo A, whose orchestra was originally identified with the Lucky Strike Hit Parade, is admiring the new Hammarlund Super Pro model SP-600-JX communications receiver recently demonstrated at the I.R.E. convention. This new model of the well-known Super Pro is claimed to have image rejection of 74 db or better throughout the entire 0.54 to 54 mc. range of the receiver. Sensitivity averages 1.25 microvolts on a 30-percent modulated signal with a 10:1 signal to noise-power ratio. Operation on any of six crystal-controlled fixed frequency channels within the range of the receiver is immediately available. Double conversion above 7.4 mc. is featured.

A versatile low-cost multimeter, assembled from an Eico kit, appears in photo B. This handy test meter for the experimenter, student or serviceman has 31 different 1000 ohms-per-volt ranges. It provides a.c./d.c. voltage ranges from zero to one volt, up to 0-5000 volts; current readings up to 1 amp.; resistance ranges in ohms 0-500, 0-100,000 up to 1 megohm.

Fashions in new UHF antennas are forecast by the strange-looking designs shown in photo C. These experimental UHF-TV antennas built by RCA engineers at Stamford, Conn., bear such colorful titles as "Bow Tie," "Double Vee," "Corner Reflector" and "Yagi."

The remote-control unit of the Bell high-fidelity amplifier shown in photo D enables owners of custom-built phono-radio and television combinations to switch to and from radio (or television) or phono recordings, without stirring from their chairs.



C

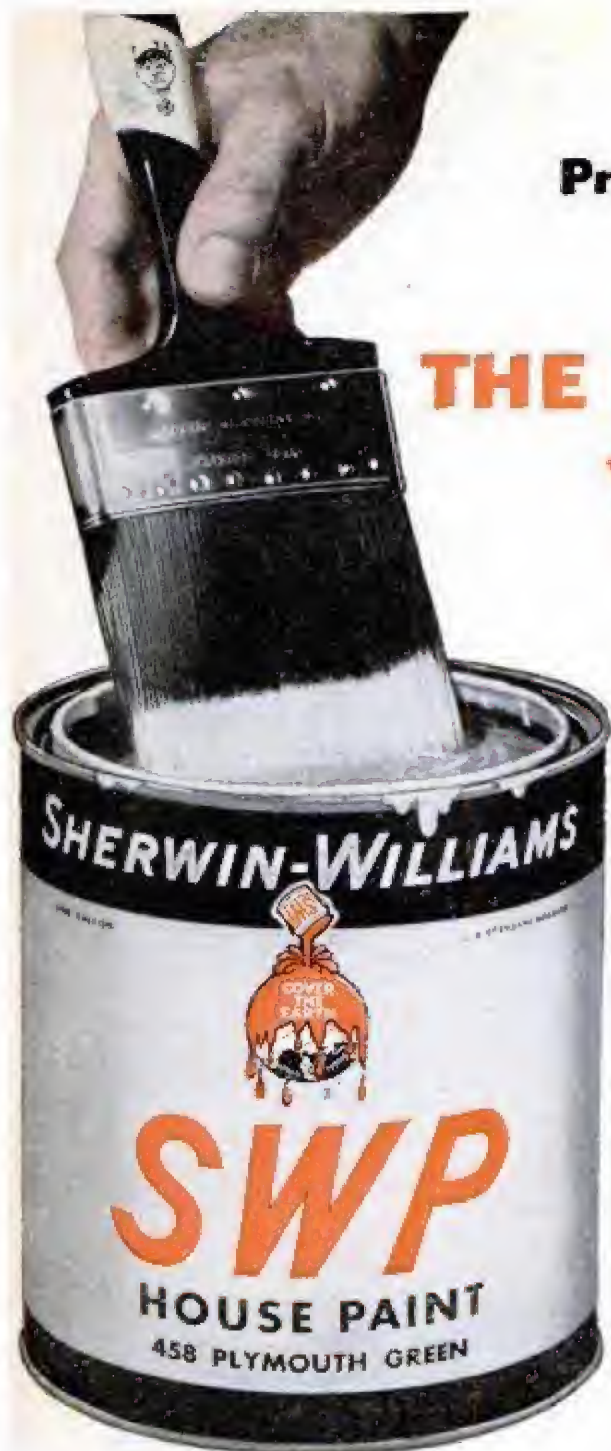


D



**Protect the Increased Value
of Your Home with**

THE BEST HOUSE PAINT YOU CAN BUY!



This sketch illustrates the greatly increased value of many residential properties in the last few years.

Don't gamble with ordinary house paint when the best costs so little. Protect the increased value of your home with the best house paint you can buy.

Many house paints cost less than famous SWP. But no house paint offers so much real quality at so little cost. That's because SWP House Paint is *Weatherated* . . . rated by the toughest of testing procedures to withstand the worst that weather and wear can offer. Tested toughness is built into SWP for lasting beauty and protection. And enough SWP for the average six-room house costs less than \$45.00!

Now is the time to paint your house with SWP. Look for the familiar "Cover-the-Earth" sign . . . the sign of a friendly Sherwin-Williams dealer who will recommend a reliable painting contractor, if you wish. He can help you with *interior* decoration, too. Ask for your free copy of the Home Decorator or ask to see the Paint and Color Style Guide.

IT'S WEATHERATED

SWP House Paint is tested rigorously for its ability to resist chalking, checking, cracking, fading and dirt collection.



NOW is the time to paint your house with

SHERWIN-WILLIAMS PAINT

Before-and-After shots prove it... filters are "worth their weight in gold"

It's almost like magic—what a filter over your camera lens can do. If you're looking for an easy and inexpensive way to add new life and sparkle to your pictures, Kodak Wratten Filters are the answer.

The pictures on this page show just four



Normal photograph—This snapshot has good composition but little else. The sky is especially flat.



Taken with Yellow (K2) Filter—The picture now has life and quality. Clouds are well defined.



Normal photograph—Again this is a nice album snapshot—everything in order, but without real life.



Taken with Yellow (G) Filter—Here you see even more sky emphasis, thanks to more powerful filter.



Normal photograph—Here you need a green filter to emphasize foliage and clouds and improve skin tones.



Taken with Green (X1) Filter—See the difference? It's a simple matter to do the same for your snapshots.



Normal photograph—A "bare" lens has missed the excitement of this potentially dramatic shot.



Taken with Red (A) Filter—This filter gives you the ultimate in startlingly dramatic contrast.



Normal Close-up



With Kodak Portra Lens 1+



With Kodak Portra Lens 2+



With Kodak Portra Lens 3+

For extreme close-ups—Kodak Portra Lenses 1+, 2+, and 3+ give pronounced close-ups of subjects with both still and movie cameras. Place one in front of your camera lens to step up its power for short-range photography of people, nature studies, and

table-top subjects. Kodak Portra Lenses are graduated in power, as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. The pictures above show you how you can "move in" with a Kodak Portra Lens. From \$2.59.

Other inexpensive lens attachments do amazing tricks too

Why stop at filters? Why not go on and discover all the new thrills awaiting you and your camera when you use other inexpensive lens attachments? Some of them are shown on this page. Others, like a Kodak Telek Lens, Diffusion Disk, or Close-up Attachment, you can see at your Kodak dealer's.

Once you get in the habit of using lens attachments, you'll never be satisfied with just a plain snapshot. That's because you'll know that so much more is possible—simply by slipping an inexpensive attachment over the lens of your camera. Try it once and you'll buy the idea right from the start.



"Warm up" your color shots with a Kodak Skylight Filter—With this filter you get warmer-tone pictures of subjects photographed in open shade and on overcast days. Use it, too, to reduce the bluish cast that often appears in distant mountain and marine scenes. And if you ever have occasion to take pictures of sunlit snow scenes, you'll find the Skylight Filter highly valuable. Prices start at \$1.65.



Reproduction from normal color transparency



Reproduction from color transparency using Pola-Screen

Darken the sky in your color pictures—A Kodak Pola-Screen does the trick—in color or black-and-white. Also, it serves to subdue reflections from glass, wood, water, and other non-metallic surfaces. The effect your Pola-Screen will have on the picture may be predetermined by looking through the Kodak Pola-Screen Viewer—a miniature screen which fits over the indicator handle of your Pola-Screen. Varying degrees of sky-darkening can be obtained by rotating the screen. Price of Viewer, \$6.75; Pola-Screens, from \$6.75.

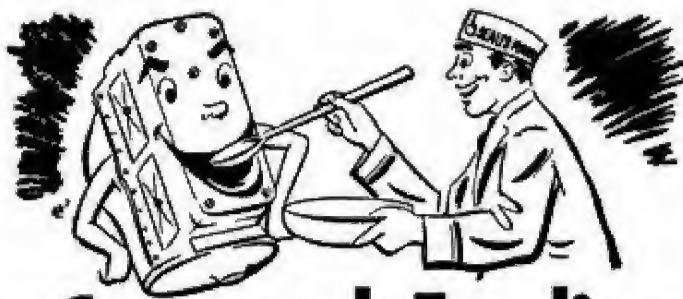


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Care and Feeding of Engines

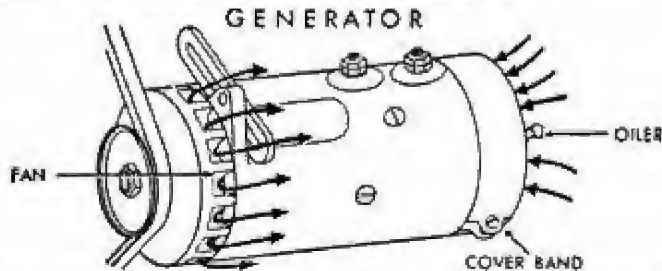
BY S. P. CORP

GENERATOR MAINTENANCE

Your generator is a busy power plant. It must keep the battery in full charge, supply ignition, and operate lights and electrical equipment. Regular lubrication, inspection, and cleaning are necessary for dependable generator performance.

LUBRICATION should consist of 3 to 5 drops of medium engine oil each time the car is lubricated. Avoid over-oiling, which is worse than lack of oil.

INSPECTION is needed every 5000 miles. Clean generator and inspect generator fan and ventilating holes. Holes should be open and free from dirt.



Air must circulate through the generator, taken in at the rear and expelled at the front. Remove cover band and check brushes and commutator; if oil-soaked and worn, replace them. Check inside of cover band for spots of solder, which would indicate generator has been running hot. If you find such spots, have complete charging circuit checked for high charging rate. If twice-a-month specific gravity readings of battery show between 1.260 and 1.280, generator is behaving perfectly.

REAR WHEEL SQUEAK

If you hear a single sharp squeak as you start your car in reverse, one of the rear wheel hubs is loose. On most cars, hubs are fastened to a keyed, tapered rear axle shaft. The outer axle nut holds hub tight. A loose nut will allow hub to work on taper, wear the key and keyways, causing the squeak.

Remove hub cap, cotter pin and nut. Tighten nut to next cotter pin hole and install a new cotter pin. Failure to do this will allow hub to work on taper, key, and keyways, resulting in an impact loading which causes undue stress on all parts in the drive unit, eventually resulting in breakage.

INSTALL KROMEX RING SETS

To get maximum ring mileage under the high engine speeds, high combustion temperatures, and high compressions of late-model cars and trucks, be sure to use Sealed Power Kromex Ring Sets. They have chrome where it counts, to fight heat, friction, corrosion, abrasion. Write for your free copy of new illustrated booklet, "MORE POWER." Dept. G-8, Sealed Power Corp., Muskegon, Mich.



Ride 'em, Lumberjack!

(Continued from page 86)

three classes—three, five and seven-horsepower. Contestants must start with a dead motor, get it purring, then rush over to a log and begin slicing away.

Motors are finely tuned before the contests and usually start instantly. But sometimes a motor sputters, then goes dead.

Then there's the matter of running into big knots in a log. Two are bad. Three are good—that gets you another chance.

With the three-horsepower saw, Roby had knotty problems and didn't place. But in the five and seven-horsepower events he was in top form and took first in both. These events clinched for him the title of All-Around-Champion Lumberjack.

Two other champions of particular note were Mrs. Gladys Johnson and Mrs. Mary Gentry, housewives and sisters who placed first in the women's gang-sawing with a crosscut. For three years now they have bested all the younger women in the area.

"We don't practice," said Mrs. Johnson. "Housework keeps you in shape for sawing. Only thing to remember is not to ride the saw—let it glide. And work together. When my sister and I were kids we were often at odds. But as you grow older you learn the importance of teamwork."

Perhaps the biggest event of the whole show was not held on the rodeo grounds. This was the annual log auction.

For weeks, lumbermen of the area keep their eyes peeled for choice logs and put them on a truck to compete for the prize load. The logs are scrubbed carefully—just like fat cattle in a livestock show. Then the huge trucks with their mammoth loads are jockeyed expertly down Main Street through the crowds and to the judges.

Many of the loads are donated or partly donated by lumber companies and auctioned off to provide prize money for the rodeo contestants. The auctioneering is done by probate judge Ben H. Bear, who raps his cane on a load of logs with the same commanding force that he uses in gaveling attention in the courtroom.

"Look at those long-stemmed American beauties fresh from the forest," he cries. "Got a bid of \$105 per thousand. Who'll make it \$110?"

The 1951 prize load, wheeled into town by the White Pine Lumber Company, was beautifully grained yellow pine—8320 feet of it. The load drew the high bid of \$117.75 per thousand feet but the real tribute came from 72-year-old S. R. Wheeler, a retired lumberjack standing in the crowd. He said, with a sigh, "How I'd like to get a saw into that pine!"

★ ★ ★

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hi-level
Battery...**



Otto Graham, star quarterback of the Cleveland Browns and one of the outstanding passers of all time, says, "Buy the Prest-O-Life Hi-Level Battery that needs water only 3 times a year in normal car use...it lasts longer, too!"

needs water only 3 times a year

IN NORMAL CAR USE

...lasts longer, too!"



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PREST-O-LITE BATTERY COMPANY, INC.

TOLEDO 1, OHIO

Here's how for home painters



How to burn off housepaint without burning the wood. A blowtorch gets rid of blisters quickly—but often burns wood too. A simple trick to prevent this: attach a screen wire to nozzle of blowtorch. This will spread flame evenly, prevent

deep burning of wood at any one place. Here's another helpful hint: with new Devoe Wonder-1-Coat House Paint—you get 2-coat beauty and protection in just one coat! (Only bare patches of wood need a prime coat.)



Quick way for cleaning paint off windows. Just take an ordinary pencil eraser, work it down to a chisel edge on fine sandpaper—and presto you have a paint wiper. Devoe Trim & Shutter paints are tops for sash, by the way. Easy to apply

—quick, hard-drying. Re-coating seldom necessary in less than 5 or 6 years.



Revive that old fiber rug. Give it a new look—by painting it. Put newspapers underneath, choose your favorite color and paint it right on the floor. Simple—and economical! Use Devoe Mirrolac Enamel. Great beauty and wear-resistance are

features of this unique paint. Available in many colors.



You don't need an eagle eye when painting stripes. Attach two strips of flat masking tape to the surface you want to paint—leaving a blank area in-between. Paint this area . . . let dry . . . then zip off masking tape for a neat straight stripe!

Consult the Devoe Library of Colors for color choice—over 200 shades!

You can get all the painting accessories that you need—and many more helpful tips—at the sign of the Devoe Diamond. Why not stop in and see your Devoe Dealer? He's listed in the Classified Phone Book.

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PAINT**

Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Removing Paint

Q—I'm having trouble removing paint from walls and ceilings of two rooms in preparation for redecorating. The paint was blistered in spots and this came off easily. But on all other areas it adheres firmly and paint remover works so very slowly that the job apparently is going to take weeks of time. Isn't there some faster method I can use?

—M. M., Md.

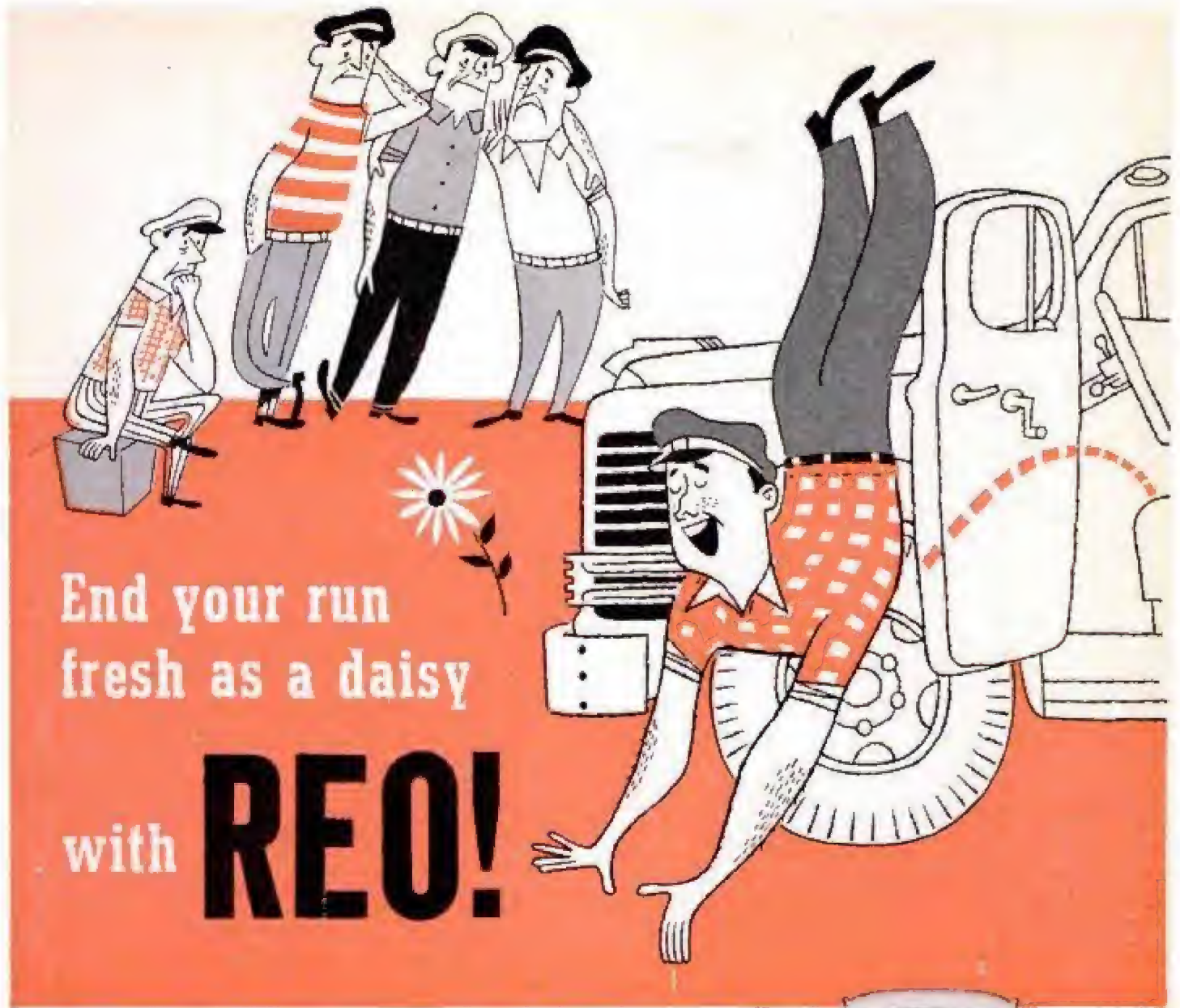
A—Evidently the walls and ceilings are coated with several heavy applications of oil-base paint. The undercoats probably are many years old and have become thoroughly oxidized. The question that comes immediately to mind is, why bother to remove the paint from those areas where it adheres firmly to the wall? It would seem much simpler to brush or scrape off all the loose material and sand the depressions out to a featheredge. This would produce a surface suitable for papering, or, if you wish to redecorate with paint, use a texture paint in whatever color desired. The texture paints will conceal minor wall and ceiling defects quite effectively. When applying this material be sure to follow the instructions in all details.

Bandsaw-Blade Runout

Q—I have a small bandsaw (10-in. wheels) in my home workshop and I have trouble with the blade twisting when making a cut. I bought the machine new and it has had very little use. In order to saw at all in any thickness of stock, the piece must be turned at an angle with the table. The blade cuts slowly, heats and seems to burn the edges of the stock. What is wrong and how can I cure the trouble?—R. N., N. H.

A—The trouble you describe is known to the trade as blade runout and is commonly caused by the set teeth on one side of the blade becoming dulled. This can happen in a number of ways, such as striking a nail or other hard obstruction embedded in the stock. Also the blade can be dulled in this manner by careless handling when colling and uncolling or when storing in drawers with other tools. Blades for larger machines are simply reset and filed to correct the defect, but due to the inexpensiveness of blades for smaller machines this is hardly worth-while, as the cost of renewing the blade would be as much, or possibly more, than the cost of a new blade. We suggest that you replace the damaged blade with a new one of the same length and width.

(Continued to page 220)



End your run
fresh as a daisy

with **REO!**

It's a fact . . . *Gold Comet* power sends you zooming up tough grades with far less shifting than ordinary trucks. Sturdy roadability, turn on a dime radius and that smooth riding quality means you can really enjoy after-work hours when you drive . . . REO!

The boss'll enjoy new dependability, new operating profits with REO *Gold Comet* power, too. Easy maintenance, low gas and oil consumption and bigger payloads through Reo "More-Load-Design" add up to . . .



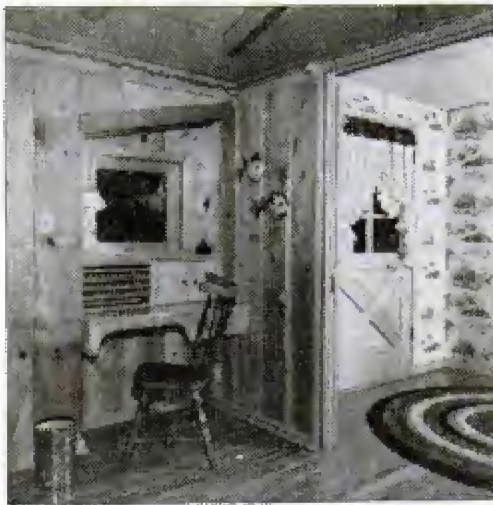
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Big NEW—and FREE—24-page book, "Enchanting Homes of Western Pines," contains hundreds of suggestions for building and remodeling with the woods of the Western Pines*. Here are 68 pictures, some in full color, with details of exteriors and interiors to inspire you and assist you.

Home craftsmen have found that smooth textures and straight, even grain make the woods of the Western Pines* a joy to use in any workshop project. They're light to handle, cut and work easily, and take paint, stain or wax beautifully. And they add *lifetime loveliness* wherever they are used!

Before you start work on those bookshelves, built-ins, hallways, bunk bedrooms, breakfast nooks, or basement dens, send for your FREE copy of "Enchanting Homes of Western Pines." Write to WESTERN PINE ASSOCIATION, Dept. 536-N, Yeon Bldg., Portland 4, Oregon.

These are the Western Pines

- IDAHO WHITE PINE
- PONDEROSA PINE
- SUGAR PINE

(Continued from page 218)

Renailing Warped Flooring

Q—The hardwood floors in my new home are $\frac{3}{8}$ in. thick and have warped, or cupped, so much that they are unsightly. At the same time the individual boards seem to have shrunk across the width, leaving joints open as much as $\frac{1}{8}$ in. I have sanded and refinished the floors once but still the boards seem to be warping in the same manner as before. What can be done to prevent this?—A. S., Idaho.



A—You do not say whether the flooring has been laid over a concrete slab or over a conventional wooden subfloor. We would be inclined to suspect that the presence of moisture under the floor is the cause of the trouble, but the method of eliminating the defect depends on the floor construction. As we view the problem from the information at hand, it appears to have no simple solution. Although, it might be possible to effect a cure by taking up the flooring and renailing it, we hesitate to recommend this procedure as it is a slow and rather difficult process and is certain to result in some damage to the individual floor boards. Some homeowners with this problem have drilled and counterbored the floor boards for screws. After the screws are driven, the counterbored holes are filled with hardwood plugs of a contrasting color. It will be necessary to locate the screw holes in an irregular pattern over the whole of the floor area. A regular pattern of contrasting plugs is seldom attractive. As an example, where two boards are butt-joined drill four screw holes, two in the end of each board. Then if there is another butt joint in the same course, drill only two screw holes, one in the end of each board. When the floor is sanded and finished the effect is similar to that of a ranch-plank floor, although, of course, the floor boards are not of random widths as is the case with ranch-plank flooring.

Soundproofing Basement Ceiling

Q—I'm planning a recreation room in my basement and would like to soundproof the ceiling over the recreation-room area. I'm told that the soundproofing material must be placed between the floor joists and that the ceiling should be lathed and plastered. This would be expensive. Is there any simpler, less expensive way to do this?



—B. U., Ind.

A—There are several types of ceiling tiles now available which are said to possess soundproofing qualities suitable for such an installation as you are contemplating. These tiles are quite simple to install, as they are attached to furring strips nailed to the floor joist. Special fasteners, developed for the purpose, hold the individual tiles in place. If the ceiling joists are uniformly spaced on 16-in. centers, the tile can be attached directly to the joists without the necessity of installing furring strips. However, this spacing must be carefully checked beforehand and when installing the tile care must be taken to assure that they do not "gain" on the width between the joists as otherwise you may end up with several open joints. If there is any variation in the distance between the joists it is advisable to install furring strips. In handling the tile be especially careful not to break or otherwise damage the edges and corners. When installing the tile it is important to follow the manufacturer's instructions in all details.

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● The Timken Thrust roller-bearing does it—makes it easy for you to stop squeaking floors, cracking plaster, sagging beams. Five exclusive features—no other floor leveling device has 'em. Rated at 8 tons for your safety—yet independent testers loaded Perma-Jack over 12 tons, before the first minor sign of stress appeared. Clip coupon for the free booklet that gives you Perma-Jack's secret of easy, safe beam-bolstering.

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- 2 Easy-Turning Acme Square Screw Threads
- 3 Extra-Heavy Top and Base Plates
- 4 Two Extra-Heavy Support Pins
- 5 Anti-Rust Baked Enamel Finish Inside and Out



Over a million Perma-Jacks have been used in homes, garages, farm and commercial buildings, for quick, economical, permanent repair. Two sizes (Perma-Jack 4'10" to 8'10"—Perma-Jack Special 21" to 36") fit every need. **SEND COUPON** for the illustrated folder that shows you how Perma-Jack can help you save substantial repair costs on your property.

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HITCH
A RIDE
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CAR!**

You have a firebug for a passenger when you drive a car with defective wiring. Neglected wires do cause automo-

bile fires. Millions of dollars worth of cars, trucks and buses go up in smoke every year. National Safety Council figures tell the same story all over the country—with "caused by defective wiring" fires running as high as 92%.

Don't play with fire. See that *your* wires and cable are checked *today*. Not only to prevent fire, but to prevent hard starting, poor engine performance, battery failure. When wiring is bad, install new genuine Wiry Joe Wires and Cables.

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CITY _____ ZONE _____ STATE _____



Lightning Trappers

(Continued from page 75)

was hit repeatedly by a three-million-volt charge in the tests. The best protection against its fury proved to be short lengths of aluminum on the mast and the stern light, grounded over the side of the boat with copper wire.

Westinghouse's newest lightning laboratory is located at Sunnyvale, Calif., where custom-made 12-foot arcs blast industrial equipment to test its capacity to withstand the heaviest strokes of natural lightning.

Huge 2.4-million-volt surges of crackling electricity are produced by a 25-foot-high impulse generator. Four heavy, brightly colored plastic columns support 24 banks of capacitors—storehouses of electricity. Gleaming chrome spark gaps, heavy resistors and other equipment mounted on five smaller inner columns make the whole thing look like a modernistic Christmas tree.

Lightning bolts are fired from this machine into miniature haystacks and barns, setting them afire. They literally disintegrate wooden planks. They blast the bell towers off model country schoolhouses that lack lightning protection.

But when "di-ion gaps" are provided for power-line transformers carrying electricity into the schoolhouse, the multimillion-volt charge is dissipated harmlessly. The lights in the schoolhouse don't even flicker.

But lightning can be dangerous if care is not taken. Some 400 deaths are reported in the United States each year from this cause. Of course, this doesn't begin to compare with 33,000 household and 40,000 traffic deaths annually, but this figure could be reduced materially if people would realize the power of lightning.

If you don't want to be that one American in 365,000 who is killed by lightning each year, heed these safety precautions:

When a storm threatens, keep off golf courses. Don't ride bicycles or horses in

(Continued to page 224)

You Name It!

Here are the correct answers to the "You Name It!" photo quiz on pages 78 and 79:

1. Tendrils of a carnation
2. Ripe strawberry
3. Spaghetti
4. Whole-wheat bread
5. Table-tennis paddle
6. End of grapefruit
7. Interior of red pepper
8. Section of anthurium leaf
9. Ends of books



A "CLOUDBURST" in this 100-foot water tunnel proves the effectiveness of advanced methods of sealing against moisture, dust and drafts. Bodies move past high-pressure water jets that douse them from every angle. This is typical of the thoroughness with which all Chrysler Corporation cars are built.

A CAR'S BODY TELLS A LOT ABOUT A CAR'S REAL WORTH TO YOU

Chrysler Corporation engineers, stylists, and production men work together, so that body and chassis form a perfectly balanced unit — created from the start for your safety, comfort and *driving and handling ease*.

The way a door latches and holds . . . the amount of head and leg room you get . . . the comfort of the seats . . . breadth of vision

. . . ease of getting in and out — all these are easily read guides to the worth of any car.

In a Plymouth, Dodge, De Soto or Chrysler, you get a superior body — and a superior chassis — engineered to give you the greatest worth for your money. You can prove this for yourself just by calling your nearby dealer and driving one of these great cars.

CHRYSLER CORPORATION engineers and builds PLYMOUTH, DODGE, DE SOTO, CHRYSLER CARS & DODGE TRUCKS

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CHRYSLER CORPORATION ENGINEERS follow through each step in body construction. Here an engineer studies the double welding of a Dodge body, one of the many things that mean safer and quieter cars for you



THE NEW C-200. Advanced body designs are created to learn practical applications of new concepts of style, comfort, fabrics and fittings, performance and safety. The Chrysler C-200 is the prototype of a dramatic new convertible.



—yours with these Wizards with Wood

Making something that needs finishing? Mending something that needs gluing? If it's made of wood ask for Firzite, Satinlac and Weldwood Glue. At hardware, paint and lumber dealers—or mail coupon for leaflets.

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To make things or fix things, use Weldwood Glue for all wood-to-wood bonds. Makes joints stronger than the wood itself. Mixes easily with water. Stain-free, rot-proof...highly water-resistant!

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PLASTIC RESIN GLUE

Gets that blond or pickled effect—



Produce those magical "woody" effects—on hard wood or soft, plywood or solid lumber with White Firzite. For light pastel tones, tint with Colors-in-Oil. (On fir plywood stain jobs, tame that wild grain with Clear Firzite.)

WHITE FIRZITE*

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—without shellac or varnish. On furniture, panelling or woodwork, there's nothing like Satinlac. Brings out natural grain and color beauty of any plywood or solid wood. Avoids that "built-up look; will not turn yellow or darken with age. "Water-clear," easy to brush or spray, dries ready for next coat in 2 or 3 hours.

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exposed locations. Avoid shelter under isolated trees. Avoid exposed locations on hilltops. Stay out of water, either indoors or outdoors. Get indoors. Take shelter in a large building or house but stay away from chimneys or fireplaces. If a storm develops while you are motoring, stay in your car. Steel-topped automobiles, busses and trains are the safest places you can be. If you must get out, avoid having one foot touching the ground while the other touches the car. You'll make a good conductor from the metal car to the earth.

Stay away from electrical fixtures, lights, telephones, radios, television sets and other electrical conductors. But there's no point in rushing around turning off lights, radios and appliances. It won't protect them if lightning comes. An electrical discharge that's jumped thousands of feet in the air won't stop at a switch that has a gap only a fraction of an inch wide.

One popular error, given false authenticity by some science books and teachers, is that lightning rods prevent lightning by warding away the negative bolt with positive charges from the earth. What the lightning rod does is convey the charge to the ground quickly, keeping it from the structural parts of the building.

Karl B. McEachron, former head of General Electric's high-voltage laboratory gives this reassuring advice: "If you heard the thunder, the lightning did not strike you; if you saw the lightning, it missed you; and if it had struck you, you would not have known it." ★ ★ ★

Shall We Move to Another Planet?

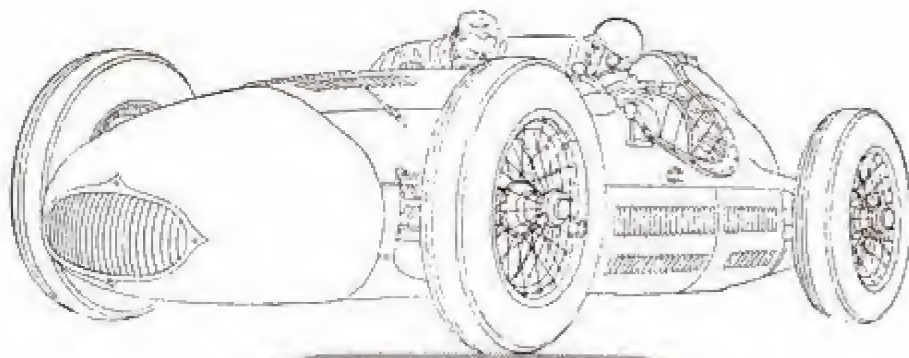
(Continued from page 69)

through space to a comparable satellite station just off the moon, in some kind of space ship with contours determined by factors other than streamlining, which is of no value in frictionless space. The last stage of the trip would be the descent to the moon in a vehicle that uses rockets for maneuvering in order to land.

The idea of satellite stations was first proposed by German scientists who showed that if an object were placed in an orbit around the earth at a speed based upon altitude, the object would continue to circle the earth without power. Its centrifugal pull would exactly balance the gravitational pull of the earth.

An orbital station at 350 miles' altitude would have to move at 16,200 miles per hour to maintain its position; at 4000 miles' altitude the artificial moon would require an initial speed of 13,320 miles per hour.

(Continued to page 226)

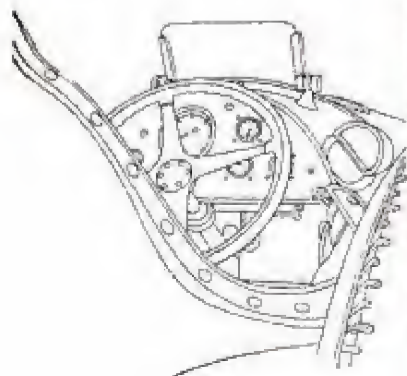


CHAMPION

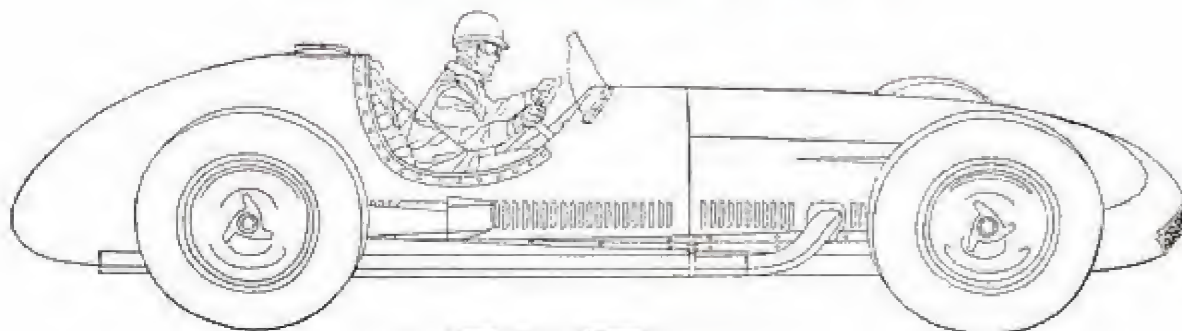
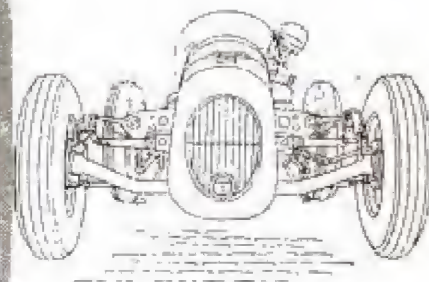
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Use the spark plugs champions use!



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Finishing an Extra Room?

YOU Can Apply Modern Ceilings Easily with **NEW UPSON** **CEILING TILES**

INSTALL THEM YOURSELF!

Re-cover right over cracked plaster on 12' furring strips. In new construction, apply direct to joists. Positive, permanent application is quick and easy with color pins that match the neutral ivory finish. 6-ply laminated construction. Crackproof! For kitchen and bathroom ceilings, too.



WASHABLE AND WATERPROOF!



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I enclose 10c for 32-page Idea Booklet. Include Instruction Sheet for Applying Upson Ceiling Tiles.

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UPSON Ceiling Tiles are 12" square and $\frac{3}{8}$ " thick with square corners, Shad-O-Beveled edges.

Dr. Wernher von Braun, chief developer of the German V-2 and now a research consultant for the Army, suggests that a suitable altitude for a satellite would be some 1037 miles out from the earth's surface. He believes that the station itself might resemble 20 railroad cars parked in a circle. Rotation of this odd structure would create centrifugal force that would give people in the hollow rim a condition of gravity. A solar furnace at the hub of the wheel would be kept pointed at the sun, obtaining needed amounts of heat.

Doctor von Braun thinks that the satellite could be made of plastic materials carried aloft in a collapsed state by transport rockets, to be inflated after assembly. The transport rockets would be about 200 feet tall and each would carry a 30-ton payload.

Eventually, it is believed, there will be a number of satellite stations revolving around the earth at different altitudes for different purposes. Within 15 years we could put an unmanned satellite on an orbit about 400 miles up, in the opinion of W. B. Bergen, chief engineer of the Glenn L. Martin Company. Later, men could be shot aloft to live on board the satellite.

Such stations would be of great value for astronomical purposes, as television-relay points and even as military-observation points. There's a suggestion that other nations are thinking along those lines.

Dr. Heinz Haber, one of those doing space-medicine research for the Air Force, thinks that the first satellites will be small instrument carriers. They will report back to earth the conditions aloft until transmitting power is exhausted. His estimate is that a rocket of 200-ton thrust, as compared to the 20-ton thrust of a V-2, could serve as the prime booster of a multiple-stage rocket which could establish a satellite. He notes that rockets of that thrust already are being planned.

A means would have to be found to bring the instrument satellites back to earth "to avoid contamination of this planet's immediate surroundings with stray objects."

The job of getting a person safely back to earth from a larger satellite will be almost as difficult as the task of getting him aloft. The problem is to find a way of dropping down through the atmosphere slowly enough to avoid incandescence. Considerable heat erosion occurs on the nose of a two-stage rocket fired to an altitude of only 250 miles, and the nose of a V-2 is reported to glow dull red from frictional heat.

Dr. Fred L. Whipple of Harvard College Observatory calculates that an ordinary chicken feather fluttering earthward from a height of 1000 miles would pick up enough

(Continued to page 228)

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ends moisture damage in Workshops,
Basements, Darkrooms



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anywhere—18½" high—
20½" long—11¾" wide

Put a permanent end to moisture damage the instant you plug in this amazing device. Stops mold, rust, mildew. Protects equipment, luggage, furniture. Positively controls moisture in any closed area up to 8,000 cubic feet. No messy

chemicals to bother with. Operates on pennies a day. Uses refrigeration principle. Powered by world-famous Frigidaire Meter-Miser compressor with 5-Year Protection Plan. See your Frigidaire Dealer or write for special folder giving full details. Frigidaire Division, General Motors Corp., 1529 Amelia St., Dayton 1, O.

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speed to become charred from friction with the atmosphere while still high above the earth. The assumption is that parachutes supporting a sealed cabin would melt and disintegrate. The best solution may be to use rocket motors as brakes, retarding the descent to a safe, cool speed.

No one knows how much it will cost to put the first satellite on station, or set foot on the moon, or make the first two-year-plus round trip to Mars. Only one thing seems certain, and that is that science is on its way toward doing those things.

In this connection, Dr. H. Strughold of the Air Force space-medicine group observes that "the conquest of the outskirts of the atmosphere and eventually space is a revolutionary event comparable only to the transition of aquatic animals to the land in geological times. This transition took at least 100 million years. It took only a millionth of that time for man to invade the boundary lines of space." ★ ★ ★

TV Comes to the Small Town

(Continued from page 132)

covering a 75-mile area with good reports coming in from as far away as 100 miles.

The radio-relay "dishpan" to pick up network shows is beamed eastward from here toward Columbus and Osgood, Ind., and then Cincinnati, Ohio, where the network stations are located.

Don't get the idea that because it's a small-town station, WTTV relies entirely on network productions or on washed-out movies either. It has its share of top network shows and its also has a cowboy serial for the youngsters during the day. But every week there are 40 to 44 local shows originating in WTTV's single studio. That studio is 25 by 50 feet and looks like an oversize garage. One end, which serves as a prop-storage room, is partitioned with rough burlap draperies. On the air, the draperies serve as a backdrop and look real luxurious!

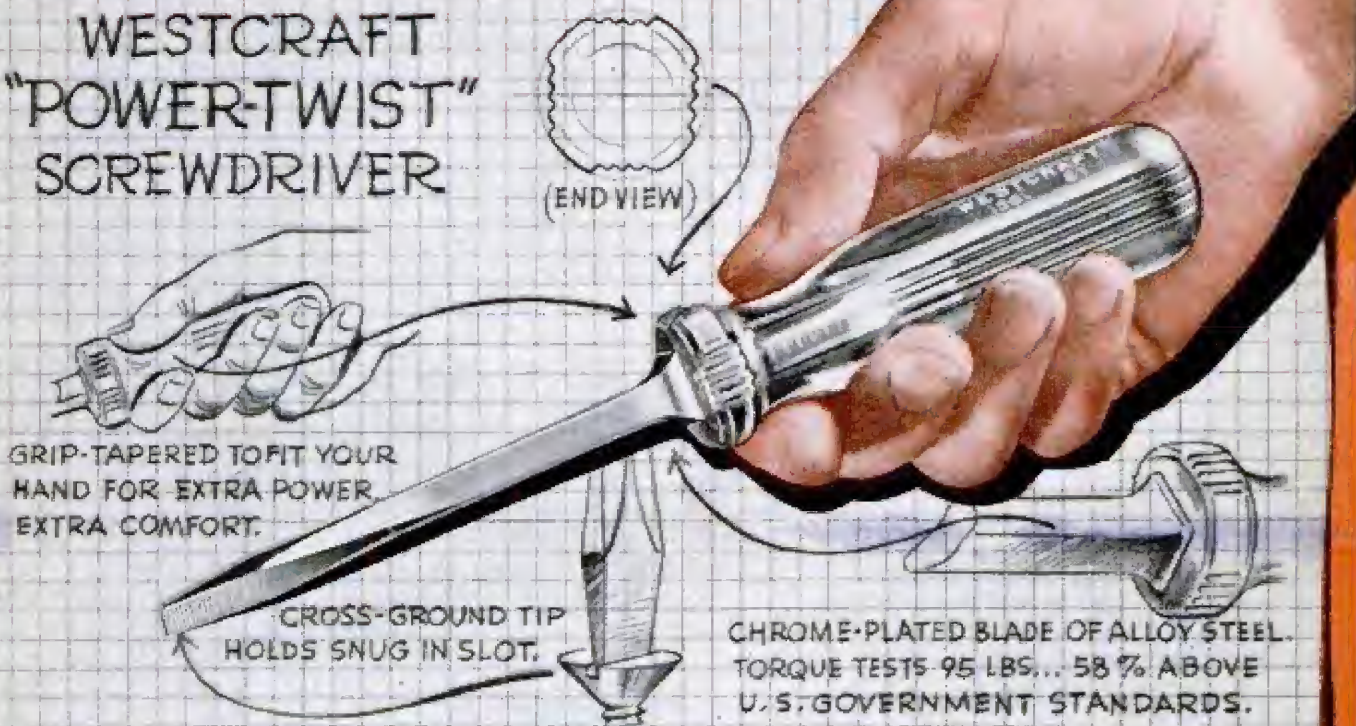
One of the lessons learned at the old studio building was that TV programs can require some strange props and scenery often gets rather large. So the new building has garage-type double doors in the outside wall of the main studio. These can be rolled back to permit trucks to back right up—literally "on stage." (Considering the fact that one farm-bureau show had live cattle and sheep as "stars," this feature takes on added importance!)

One cameraman is all WTTV needs. There have been times when two cameras were used on the same show, but to pare

(Continued to page 230)

How Creative Designing Gives You "Something Extra And Better:"

WESTCRAFT "POWER-TWIST" SCREWDRIVER



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EXTRA COMFORT.

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costs and also to allow time for camera overhauls, the station is now on one-camera operation.

When the cameraman wants to change from one lens to another, he often does it while you watch—and it's done so quickly that you scarcely notice the transition. Or, if necessary, the video-control engineer cuts in a still picture or an opaque slide while the change is made. Another technique is to black out the screen for a couple of seconds while the camera is dollyed across the studio to a new position. Surprisingly enough, none of these techniques is objectionable or, in most cases, even apparent to the viewer at home.

Pay-roll expense is kept down by doubling in brass. The production manager is also the newscaster and, at times, acts as the video engineer. The night station manager is the sportscaster and also does commercial announcing. The audio engineer is station-break and spot-commercial announcer and, at intervals, reads the weather forecast. The video engineer has his own afternoon cowboy-movie show and is the director and master of ceremonies of the station's most ambitious weekly program, *Hayloft Frolics*. This program has built up an audience over an area 200 miles in diameter. Telephone calls from viewers 100 miles away are frequently received during the telecast.

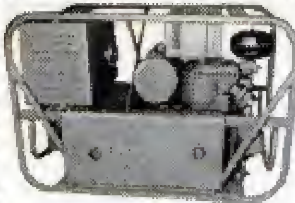
Although camera rehearsals are rarely held, the shows move along smoothly with plenty of sparkle. There's a personal approach that appeals to the Bloomington audience. The local viewers know the men and women at the station and when a performer (while on camera) says: "Earl, come in closer to get a better view for the people at home," the viewer knows that he is talking to the cameraman, who perhaps lives on the same street and belongs to the same church he does.

So now, almost four years after the original plans were laid, WTTV has settled down to the staid life of being a regular part of southern Indiana's entertainment and educational life. But the lessons learned by its staff are going to be utilized in countless ways during the coming months. As hundreds of new stations come into being, the industry's most valuable commodity will be theirs—experience. This is the one thing that cannot be bought... it comes only with weary hours of trial and error. ★ ★ ★

Discovery in Mexico of maize pollen grains believed to be 25,000 years old points up the possibility that agricultural Indians lived in Central America during that period and cultivated the plant.

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Homemade TV Antennas

(Continued from page 211)

It may be mounted on a window sill, as indicated in Fig. 2-A, or it may be mounted inside a closet or in the attic. Try several positions when mounting it and adjust it for the best pickup on the weakest station. The upper section of the mast can be lengthened to support the loop, as in Fig. 1-A, or it may be terminated at the insulator block, as shown in photo A. Any length of 300-ohm twin lead can be used.

CHANNEL	Element lengths in inches					SPACING (s)
	D1	D2	D3	E	R	
2	94.5	95.1	96.0	103.4	106.3	44.5
3	85.0	85.8	86.6	90.5	96.0	38.5
4	77.4	78.1	78.9	82.4	87.4	35.1
5	67.4	68.0	68.7	71.7	76.1	35.6
6	62.5	63.1	64.9	66.6	67.3	28.3
7	29.7	30.0	30.2	31.6	33.5	13.5
8	28.7	29.0	29.3	29.9	32.4	13.0
9	27.8	28.0	28.3	28.5	31.4	12.6
10	26.9	27.1	27.4	27.6	30.4	12.2
11	26.1	26.4	26.6	26.9	29.5	11.8
12	25.1	25.6	25.8	26.0	28.6	11.5
13	24.6	24.9	25.1	25.9	27.8	11.2

CHART B

Yagi element lengths for each channel

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The five-element Yagi shown in photo B and detailed in Figs. 3-B and 4-B is very popular in weak-signal locations and fringe areas. It is critical but will give excellent results on the channels for which it is cut. It is highly directional and a separate unit should be used for each channel. Three or four of these Yagi units may be mounted on the same mast if it is properly guyed and the antenna units are spaced approximately 30 in. apart. Best results will be obtained when separate lead-ins are run from each antenna. In this case coaxial cable is run for each antenna unit to a coaxial-type switch at the receiver. See chart B for element lengths and spacing for each TV channel. The three directors D1, D2 and D3, also the reflector R, are made of 1/2-in. aluminum tubing. The top section of the folded-dipole element (E) is 1 1/4-in. aluminum tubing and the bottom section is No. 8 copper wire. The boom, also 1 1/4-in. sturdy aluminum, is drilled at the spacing shown in chart B. Fasten each element with a brass bolt from top to bottom and use lock washers to insure a tight fit. Bolt the driven element (E) to the top of the boom and use 1-in. polystyrene insulators to support the No. 8 wire. Connect the 300-ohm twin lead at L and L (insulator terminal screws, see Fig. 4-B). Use TV stand-off insulators to relieve strain on the lead-in and to prevent it from swaying. ★ ★ ★

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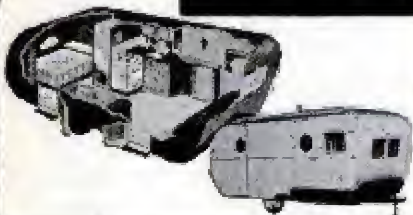
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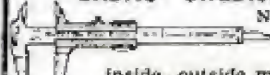
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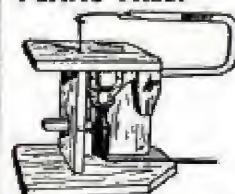
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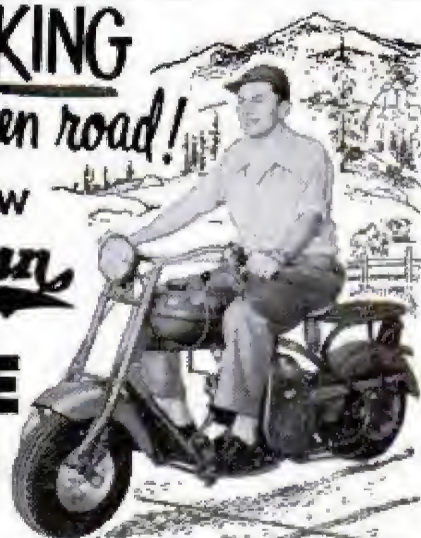
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(Continued from page 124)

produced a startling three-dimensional effect. Out of it grew the gunnery trainer—and Cinerama, which is simply a photographic view of the scene as a human pair of eyes would see it. The picture Cinerama reproduces is 146 degrees wide and 55 degrees deep, close to that seen by two eyes, which cover at best some 165 degrees by 60 degrees. No lens known can cover such a field without distortion. Hence, the Cinerama camera has three 27-millimeter lenses set at 48-degree angles. Each takes a third of the picture's total width, exposing its own reel of 35-millimeter film housed in one of the three magazines that jut from the back of the camera.

The lenses are arranged on a mount like a three-section picture frame. The one in the center points straight ahead. Those on each side point in so that the left lens takes the right side of the picture and the one on the right takes the left side. A single rotating shutter whirling in front of the lenses at the point where their lines of view cross makes simultaneous exposures on each film. Focus and diaphragm controls adjust settings on all lenses simultaneously.

To merge the three films into a single picture on the big 51 by 26-foot screen, three standard projectors in balcony booths throw the images from each film onto the screen. The projector on the right fills in the left third of the screen, the one on the left fills in the right third and the one in the center shoots straight ahead.

Because the screen is curved, there should be distortion and fuzziness, but there isn't. Great depth of focus of the projector lenses keeps the picture sharp. Distortion caused by reflected light bouncing off a screen to the eyes of the viewer has been licked by a Waller trick. The screen is not one great sheet but is made up of 1100 vertical strips of perforated tape, set at angles like a Venetian blind turned sideways. Reflected light bounces off a louver and goes behind the screen. You can sit right at the edge of the Cinerama screen, look up at a tight angle, and figures still look round and full just as they would if you saw them from a seat farther back.

Running three movie reels side by side simultaneously to make one picture poses some problems. If one projector is a fraction of a frame off kilter, the pictures look wiggly. And how to hide the lines where the films come together? This is solved by what the boys call "jiggilos." These are comblike bits of steel that fit in each projector at the

(Continued to page 236)

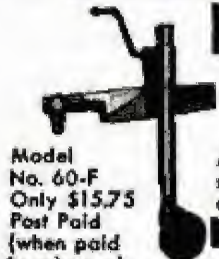
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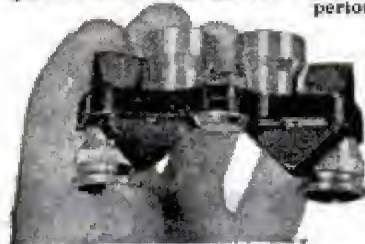
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Illustrated. Weighs only 4 oz.! Yet has field of 375 ft. at 1000 yds.!

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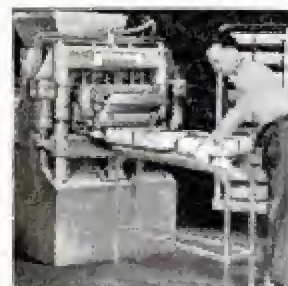
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side of the film track and jiggle up and down along the edges of the film at high speed. Like a photographer working a dodging mask under his enlarger to blend clouds from one negative into a scene from another negative, these saw-toothed dodgers fade the edges of the three Cinerama films where they join and blend them together so there's no sign of a joint.

Keeping those three films synchronized is something else. It's done by a servo mechanism hooked up to a control panel at which the control engineer sits. In front of him are three disks, one for each camera, marked with a pointer and the projector designation, "A," "B" and "C." If all three are in sync, the disks rotate and the pointers on their rims all pass marker points simultaneously. If one pointer lags or gains, the engineer knows he's got an off-kilter picture and adjusts the proper projector by remote control.

The big job comes at the start of the show in getting all the projectors to start together. It's done by the engineer and projectionists talking signals back and forth in the theater over an intercom.

The stereophonic sound that heightens the realistic illusion of Cinerama is as unusual as the movies. When the shooting crew is in the field, five microphones are placed to cover all the action that the camera sees. A sixth is placed well to one side or behind the camera to pick up the sound of people's voices or roaring engines that may be approaching or leaving the scene. Each mike makes an individual magnetic recording on a six-track sound tape. In the theater, five speakers—one for each of the five mikes that cover the action—are arranged behind the screen. Each speaker reproduces the sounds picked up by the mike that was in a similar position on the set. Three other speakers, one on each side wall and another in the rear of the theater, reproduce the off-stage noises that the sixth mike picked up. As a motor boat, for instance, roars across the set, the noise of its engine will be picked up by each of the mikes successively. And that's the way the sound comes out in the theater—moving sound that travels across the screen and roars away behind you.

Critics of Cinerama have decried the bulk and awkwardness of the big camera and the fact that it takes 4 1/2 times as much film to turn out a picture. Each frame is half again the height produced by a standard 35-millimeter lens and the film runs at 26 frames a second instead of 24 (to eliminate flicker which would be noticed out of the corner of the eye). Harry Squire, Cinerama's director of photography, Jack

(Continued to page 238)



Honestly now— would you prefer a shrinking violet?

The advertisers in this magazine all claim their products are “tops.” They are full of pride in their brand names.

Every so often you meet someone who objects to what he calls the “boastfulness” of advertising, but *most* of us Americans like it.

We like it because we know that deep *pride* in things well made goes way back into the factories and is reflected in the fine products we have to choose from when we go to buy the things we use in our homes or on our persons.

We like it because we know that pride is a spur to make better merchandise; and that it is the driving power that keeps men striving each to outdo the other in new ideas, new and better ways of doing things. The end result is a steady stream of new and better means to make life comfortable; more and better jobs for us to earn the means of buying them.

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Priestly, technician, and Marty Philbin, electrician, laugh at such talk.

"Sure it takes more film per minute," says Squire, "but when we do a take, the whole countryside is covered. There's no extra shooting to cover details. We shot the whole La Scala opera in two days—got the entire stage on film as close up as you could ask. You could see the perspiration on the singers' lips. It would have taken six Hollywood crews at least a month to do a standard movie that caught all the details we got. Can you imagine how much film they'd have to shoot?"

Nobody denies the size and intricacy of the camera. It's big and complicated. With its padded aluminum blimp to drown motor noise, it measures about a yard square and weighs close to 200 pounds. But Squire, who has circled the globe eight times and trundled standard cameras into jungles to shoot films for Frank Buck, operates the Cinerama camera on all kinds of perches. The camera has ridden in a helicopter, lashed to an open hatch. On the bow of a speedboat, it was catapulted through a wall of blazing gasoline. To get a close-up of a girl in a canoe, the boys chopped a canoe in half, rigged an outboard platform between the sawed-off end and the bow of a camera boat and the camera rode at water level.

According to Squire, there's no place a regular camera can go that the Cinerama box can't go, too. But he treats it mighty carefully because it's the only one in existence. There is another one in the making but if anything happens to this one meanwhile, there will be no more Cinerama pictures for a while.

The Cinerama potential is big. Whole Broadway shows photographed and shipped around to bring the finest talent in show business to every small town; military-training films that give a recruit the feeling of things he'll face before he faces them; travelogues that will not just show people what a foreign country is like but "take" them there and "put" them in the middle of it.

One movie expert put it this way: "Cinerama is going to dump the whole world in the lap of the people—and vice versa."

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11/16	4 1/2	1.31	1-15/64	9 1/2	4.31
23/32	5	1.44	1-11/64	5 1/2	5.38
47/64	5	1.57	1-11/32	9 1/2	5.38
3/4	8	1.57	1-27/64	6	9.95
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13/16	22	5.00	1-9/16	10 1/2	7.50
27/32	5 1/2	1.91	1 1 1/2	10 1/2	8.50
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3/8	4 1/4	2.02	1 1/4	5	6.00
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1-1/32	6	2.76	2-9/32	7 1/4	16.00
1-3/64	8	2.82	2-5/16	7	16.25
1-1/16	7 1/4	2.82	2 3/8	9	18.00
1-5/64	7 3/4	3.33	2-7/16	11	21.50
1-3/32	6	3.33	2-15/32	13	23.50
1-7/64	9	4.00	2 1/2	11	25.00
1-7/64	18 1/2	8.50	2-13/16	14 1/2	27.50
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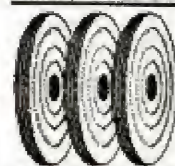
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The Owners Report on the '52 DeSoto

(Continued from page 92)

"My DeSoto gives me better gas mileage than any of the six-cylinder Chryslers. It has wonderful power."—Frederick, Md., salesman.

"I formerly was an aircraft mechanic. I appreciate the valve inserts, chrome-plated piston rings, full-pressure lubrication and floating oil filter, among other features. However, the engine makes a great deal of noise and uses an unusual amount of oil and gas no matter how conservatively I drive."—Hampton, Va., sales engineer.

"The DeSoto Tip-Toe transmission, in my opinion, is just one 'click' away from perfect. Sometimes it doesn't click full and you have some hesitation in shifting gears."—Los Angeles cafe owner.

"Of all the cars I have driven, none can compare with my new DeSoto Fire Dome."—Chicago lather.

"The maneuverability of the Fire Dome 8 with its power steering is exceptional."—Miami, Fla., executive.

"I have had considerable experience with Chrysler engines in my 14 years in the Coast Guard and have found them most dependable in boats, cars and other installations. They are economical on repairs and maintenance, and fuel consumption for the horsepower is very good."—New London, Conn., Coast Guard officer.

"A car is no better than the service it gets. My dealer realizes that and gives excellent service."—Denver, Colo., loan official.

"The car is just the right size—not too large, not too small."—Detroit lawyer.

"I've been a mechanic all my life and Chrysler offers the most advanced engineering in the industry. DeSoto is tops and I've owned 27 makes before my last three DeSotos."—Los Angeles fireman.

Among suggestions made by owners were:

"This car could be shortened to a 122-inch wheelbase and still ride well enough. This would give a shorter turning radius, a little less weight and would make a more maneuverable car for a salesman. The body and finish is good, but the car should be streamlined more for greater eye appeal."—Fort Dodge, Iowa, salesman.

"Car needs a face-lifting."—Baltimore, Md., bank official.

"I would like to see brighter colors in the upholstery."—Fairmont, W. Va., grocer.

"How about an accelerator pedal for each foot for relaxation on long trips?"—Detroit office manager. [Not a bad suggestion for any new car.]

(Continued to page 244)

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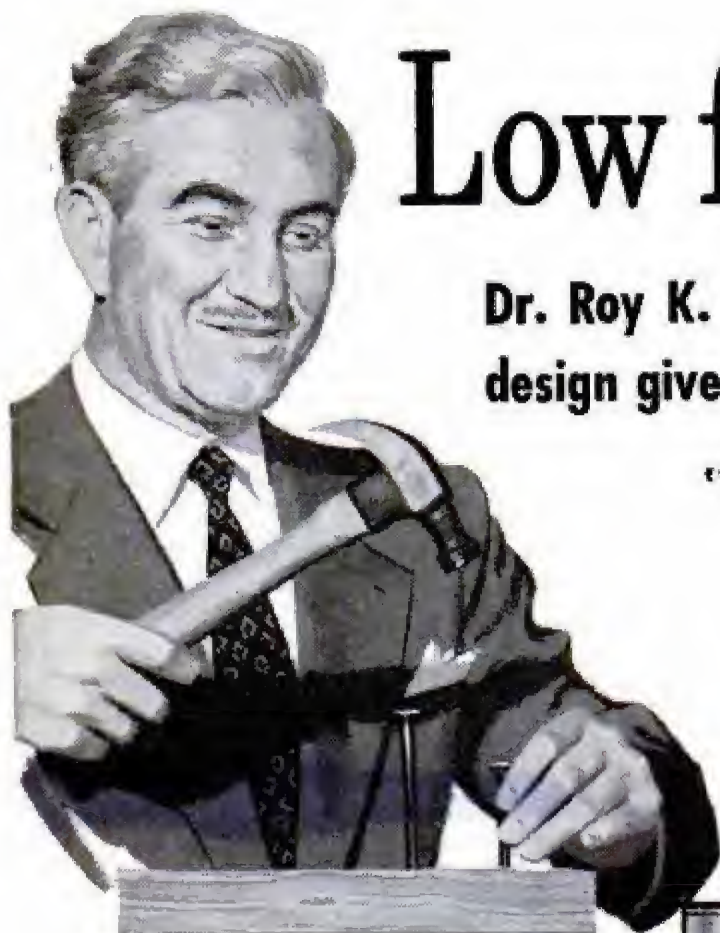
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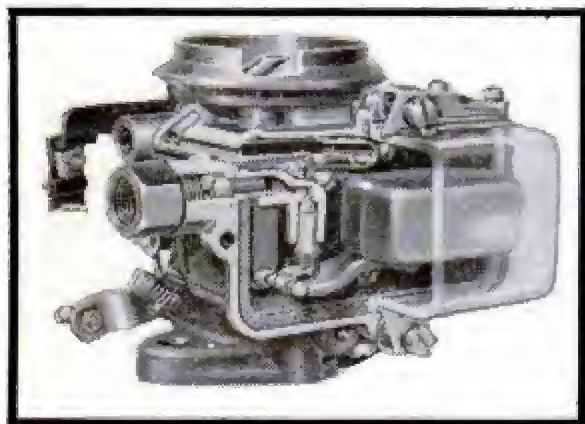
Low friction and

Dr. Roy K. Marshall* tells how low friction design gives you more power from less fuel.



**Noted science editor, educator, and TV commentator, Dr. Marshall is nationally famous for his simplified explanations of complicated things.*

"Now the same low-friction principle has been used by Ford engineers in designing the all-new high-compression Mileage Maker Six. First they shortened the distance the pistons travel (stroke) to nearly half a mile less travel in every mile of driving, for 30% less friction and longer engine life. They designed new *free-turning overhead valves* for more even wear of both valves and valve seats and less chance of the valves sticking. *Valve guides are an integral part of the cylinder head*, not separate pressed-in pieces as in many engines. This design permits a very accurate bore and more rapid heat transfer. In fact, tests show exhaust valves run about 100° cooler."



"All in all you get less friction and more usable energy . . . which adds up to more power for less money. The new Ford SIX proved this by out-saving all other Sixes in its class in the 1952 Mobilgas Economy Run.

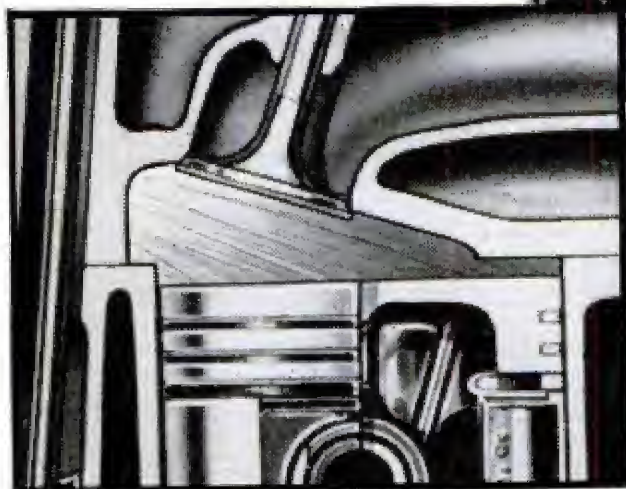
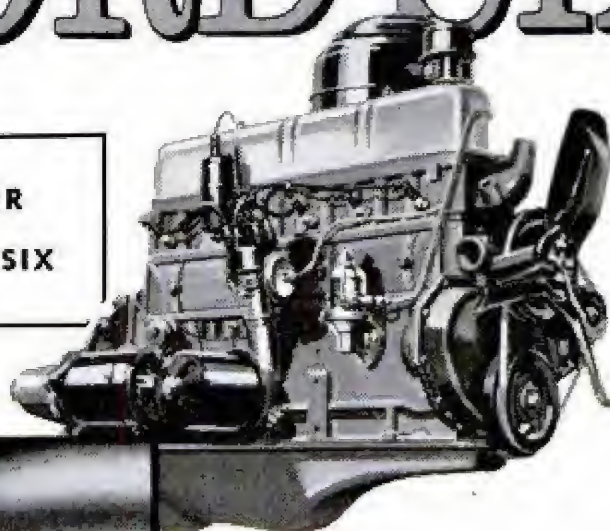
"Ford's new unit-design carburetor with compact, easily-removed metering section to simplify servicing, is part of Ford's 'easy breathing' carburetion system. The gas mixture is fed more directly into the combustion chambers through the new overhead valves."

You can pay more but you can't buy better!

POPULAR MECHANICS

the FORD SIX

101-HORSEPOWER
MILEAGE MAKER SIX



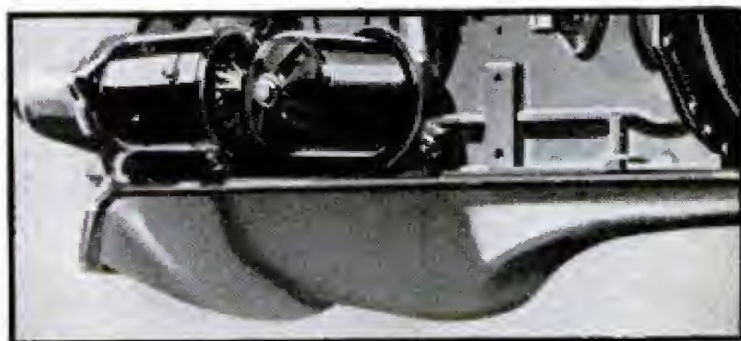
"Ford's Loadomatic Ignition, with distributor driven directly from camshaft, gives more accurate timing. And the new Power-Contoured Combustion Chambers, with spark plugs between intake and exhaust valves, control combustion so that the fuel burns evenly, completely.

"Ford engineers call this single control of fuel feeding, spark timing and combustion the Automatic Power Pilot . . . it gives you more 'go' with regular gas."

"Unlike most other engines, the Ford SIX crankcase extends deep down below the crankshaft for more support and rigidity. The flat base also permits a more effective seal between crankcase and oil pan.

"And Ford's built-in filter (exclusive with the Ford SIX in its field) cleans all the oil before it reaches vital bearing surfaces, eliminates the need for external or internal oil lines.

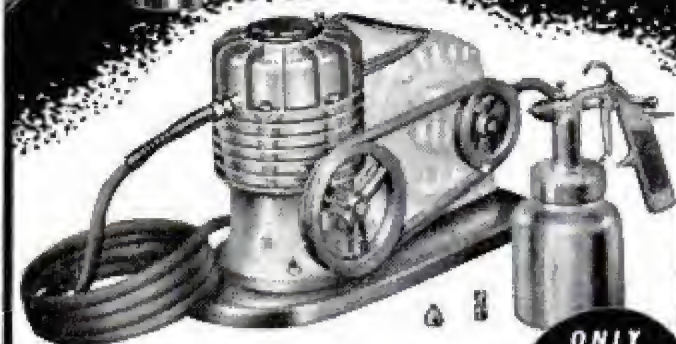
"For a real driving thrill, ask your dealer to let you 'Test Drive' the only all-new high-compression, low-friction SIX on the road."



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Lastly, in reply to the question "Specifically, what do you dislike about your DeSoto?" a Chicago salesman said, "Don't like to pay for it."

And now for my own test: I put the Fire Dome V-8 four-door sedan through its paces for 430 miles over good highways, winding roads in the mountains, in the desert and on back trails of the hills in southern California and northern Mexico. I

1952 DESOTO SPECIFICATIONS

	De Luxe and Custom	Fire Dome V-8
ENGINE		
Type	6-cyl., in-line, L-head	8-cyl. 90° V, incl. OHV
Bore and stroke	3-7/16 in. x 4 1/2 in.	3 1/8 in. x 3-11/32 in.
Piston displacement	250.6 cu. in.	276.1 cu. in.
Brake horsepower	116	160
Compression ratio	7.0:1	7.1:1
Transmission	3-speed conv. on De Luxe; Tip-Toe Shift with Fluid Drive std. on Custom (opt. on De Luxe), conv. with overdrive opt.	3-speed conv. opt.; conv. with overdrive; Tip-Toe Shift with Fluid Drive or Fluid-Torque Drive
GENERAL		
<i>(All figures on 4-dr. sedans)</i>		
Steering ratio	18.2:1 mechanical 16.2:1 with Hydroguide	18.2:1 mechanical 16.2:1 with Hydroguide
Steering wheel, lock to lock	5 1/2 turns mech. 3 1/2 turns with Hydroguide	5 1/2 turns mech. 3 1/2 turns with Hydroguide
Turning radius	20 ft., 2 in.	20 ft., 2 in.
Brakes	Hydraulic with bonded linings. Vacuum booster opt. on Custom	Hydraulic with bonded linings. Vacuum booster opt.
Tire size	7.60 x 15	7.60 x 15
Recommended tire pressure	24 lb.	24 lb.
Weight (unladen)	3550 lb. (De Luxe) 3660 lb. (Custom)	3760 lb.
Wheelbase	125 1/2 in.	125 1/2 in.
Tread, front	56-5/16 in.	56-5/16 in.
Tread, rear	59-9/16 in.	59-9/16 in.
Height, over-all (unladen)	65 3/4 in.	65 3/4 in.
Width, over-all	74 3/4 in.	74 3/4 in.
Length, over-all	208 3/4 in.	208 3/4 in.
Road clearance	7 1/2 in.	7 1/2 in.
INTERIOR DIMENSIONS		
Front-seat width	61 1/4 in.	61 1/4 in.
Rear-seat width	57 3/8 in.	57 3/8 in.
Headroom, front	38 in.	38 in.
Headroom, rear	36 1/2 in.	36 1/2 in.
Legroom, front	41 1/2 in.	41 1/2 in.
Legroom, rear	41 1/2 in.	41 1/2 in.
CAPACITIES		
Oil	5 qt.	5 qt.
Water	15 qt. (less heater)	22 qt. (less heater)
Gasoline	17 gal.	17 gal.

abused it, did everything I could to find its faults, and I'm convinced it's a rugged, well-designed and well-built car which owners will like and find a "toughie" under the most severe conditions.

The Chrysler Corporation knew what it was doing when it installed the new and exceptionally well-engineered V-8 power plant in the DeSoto chassis, thus offering Chrysler performance in a lower-priced and slightly smaller car.

There are a lot of things I like about the new DeSoto, such as the roominess, vision,

(Continued to page 246)

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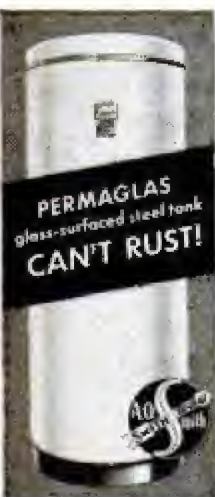
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chair-height seats and extremely comfortable driving position. There is a lot of leg-room, and a tall man can get in and out of a DeSoto without knocking his hat off. I do not like the panel that extends forward and down—actually it is a continuation of the instrument panel—reaching nearly to the floor above the feet. There are two slots in this panel where the air is expelled from the heater.

The doors open by a twisting motion of the handle and can be closed easily. I especially like the quick operation of the windows, as only two complete turns of the crank handle are required to raise or lower them. The seat cushions extend far forward under the knees and are as comfortable as those in any car in which I have ridden. All glass in the test car was slightly tinted (an optional feature) to help reduce sun glare.

The windshield is two-piece, which some may not like, but it is more economical to replace than the curved one-piece type. The windshield wipers are electric, which insures steady operation regardless of the throttle opening in hilly country. They have two speeds, slow and fast, and are controlled by a lever on the cowl.

The instruments are well-located. The heater is excellent, and controls are within easy reach of the driver. As in all Chrysler products, the cowl ventilator is retained. I prefer this type because less dirt, dust and fumes enter the car. Tunnel vents on either side of the engine, which are found in some other cars, are much lower to the ground than a cowl ventilator.

The radio is excellent. A neat map light located below the left side of the cowl comes on when either front door is opened. Glove-compartment space is average.

The starter is operated by a turn of the ignition key with the right hand—a very convenient arrangement. The starter will not operate when the car is in gear, which is good. The choke is automatic.

My test car had Tip-Toe Shift with Fluid-Torque Drive, which multiplies the torque, thus affording faster acceleration and quicker power response than with ordinary Fluid Drive. Operation is smooth; there is no noticeable jerk in shifting—only a click when the throttle is released and the automatic shift into high gear takes place. However, the up-shift into high is sluggish and much too slow.

Downshifts from top gear are quite noticeable when the throttle is depressed to engage the lower gear (below 57 miles per hour.) A gear-shift lever still is used, offering selection of two forward positions (one for regular use and one for heavy pulling

(Continued to page 248)

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—J. S. Reynolds, Daytona Beach, Fla.

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—Mr. Jules Pinto, Atlantic City, N. J.

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or quicker acceleration) and reverse. DeSoto still has two foot pedals. One is the clutch pedal, which DeSoto has marked the Safety Clutch and which now has been eliminated in other automatic-transmission installations. It must be depressed before either of the shift-lever positions or reverse is engaged. Once engaged, the clutch can be forgotten and the car can be controlled from a standstill to top speed and down again by throttle and use of the brake.

The hydraulic brakes which Chrysler pioneered are tops, and very little pedal pressure is required, especially when the brakes are power-assisted. The emergency brake is on the driver's left, and close ratchet graduations and a pivoted bracket make it easy to operate and convenient to reach. The hand lever operates a band brake on the propeller shaft; personally, I would prefer an emergency brake which acts on the rear wheels instead of the propeller shaft.

The center dome light is well-located and operates by a switch on the driver's side.

The test car had the 160-horsepower V-8 engine with overhead valves and hemispherical combustion chambers, which DeSoto calls the Fire Dome. It is a new Chrysler development. A high-compression ratio (7.1 to 1) is used, yet regular gasoline is satisfactory. The acceleration is extremely good. There is no noticeable vibration. The engine is flexible and throttles down to a walk in high gear. Actually, it is the same as the Chrysler Fire Power with a slightly smaller bore and displacement (276.1 cubic inches and 160 horsepower for DeSoto, compared to 331.1 cubic inches and 180 horsepower for Chrysler). The DeSoto, 250 pounds lighter than the Chrysler Saratoga, offers approximately the same performance in acceleration, power and top speed because of the cars' nearly identical horsepower-to-weight ratios. The reliable six-cylinder DeSoto engine also is available for the 126-inch wheelbase chassis (same as the Chrysler Saratoga). The body styles are identical for either power plant—thus DeSoto caters to either six or eight-cylinder-minded buyers, and installation of either engine is, of course, economical and practical from a manufacturing standpoint.

I couldn't make the car squeak, rattle or overheat and found only a few things I disliked. The test car was equipped with Hydraguide power steering (designed and built by Gemmer—long-time makers of good steering units). Until you get used to it, there is a definite inclination to "oversteer." In power steering, the ratio is excellent. Movement of the steering wheel from lock to lock requires only 3½ turns.

(Continued to page 250)

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Until one becomes used to its operation, the required movement of the wheel is so slight that it is confusing. After rounding a turn, the car does not right itself as nicely as a car with conventional steering; slight help from the driver is necessary to straighten the wheels to normal position.

As the power-steering unit operates only when the engine is running, the wheels turn very hard when the engine is not in operation. Effortless power steering definitely is here to stay, but the unit price still is high—slightly less than \$200. Women especially will like Hydraguide steering because of the slight steering-wheel pressure required and because, with the unit, parking can be accomplished with as little effort as driving on the highway. One finger will turn the wheel even when the car is in a standing position.

The sedan I tested had excellent roadability although, like most Chrysler products, the front end seemed quite flexible and there is some "float" at high speeds. And the new DeSoto certainly does have high speed! It is one of the fastest stock four-door sedans I have ever driven. On long stretches the speedometer would read 105 to 107 miles per hour—but, as on all other makes, I found it fast by about nine percent.

The self-compensating shock absorbers, called Oriflow, which DeSoto uses are the same as those on other Chrysler products. They are excellent shocks and certainly provide a comfortable ride at all speeds and under all road conditions.

The trunk space is large and the lid opens easily. The hood is locked from the front end. I would prefer an inside lock, which prevents theft of under-hood units. The hood is counter-balanced and stays open without the use of a rod, and I like this arrangement. The air scoop at the front of the hood on the new DeSoto is not only attractive but it is not a "phony." It serves to direct a steady flow of fresh air to the air-cleaner intake.

The front and rear bumpers are massive and of the wrap-around type. Rear fenders, as in other Chrysler products, are not a part of the body but are removable, which is an advantage if they have to be replaced. The body is solid and well-built. Doors fit well; the test car was dust-tight and water-tight.

I experimented with both premium and regular gasolines of two brands. Although 39 percent of DeSoto owners reported they use premium gasoline, I found regular gasoline to be satisfactory.

The car has good economy for its size and horsepower (see my Economy Chart). In the 1952 A.A.A.-supervised Mobilgas

(Continued to page 252)



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Economy Run from Los Angeles to Sun Valley, Idaho (1415 miles), a DeSoto V-8 won first place in Class E with 54.7368 ton-miles per gallon and 21.2777 actual miles per gallon. (Average speed of all competing cars was 40 miles per hour, and the average gas mileage for 26 contestants was 22 miles per gallon.)

In addition to our survey by mail, I personally interviewed many owners and for the most part found them to be staunch enthusiasts. Included in our mail survey were 52 percent DeSoto repeat owners. Because DeSoto is a member of the Chrysler family, owners were assured of good dealer-service representation; 76 percent of the owners reported excellent or good dealer service, 20 percent said they secured average service and only 4 percent said their DeSoto dealer service was poor—a very low percentage.

After the severe test I gave the DeSoto Fire Dome V-8, I would rate it as an excellent automobile and good value in the present market. ★ ★ ★

Fifty Years of Exploration

(Continued from page 99)

and their guide, Frank Swanda of Anchorage, set out July 9, 1950, from their base camp at Devil's Canyon, where they'd been set down by helicopter, with everything modern science could supply for comfort and speed. Two big Douglas aluminum "air skiff" boats (air-lifted to the base camp) with big outboard motors carried them, their .375 Magnum bear guns, survey equipment and modern rations into the current of the canyon river. For two days they pushed, poled and dragged their boats over sand bars that hadn't shown in the aerial survey they'd made before the trip. By July 13, they'd surveyed two dam sites and finally hit deep water. At the mouth of the Tyone River, they picked up their last cache of gasoline, dropped in advance by float plane.

Then they began to encounter boulders and white water. The rapids boiled faster as they proceeded and drenched them with spray. They stopped often to bail. As the lead boat bearing Roberts and Johnson rounded a bend, it hit three shore-to-shore swells that sent the craft wheeling crazily. The load shifted and in a moment it had capsized. Minutes later the second boat did exactly the same. Gone were their guns and supplies—deep in the heart of unexplored bear country. Choking, they were swept down the rapids clinging to the keels of the upset boats. Roberts and Johnson

(Continued to page 254)



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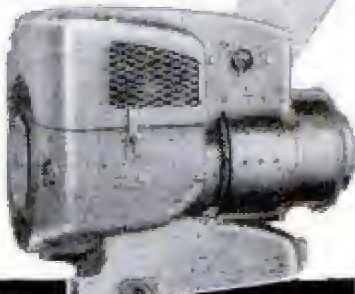
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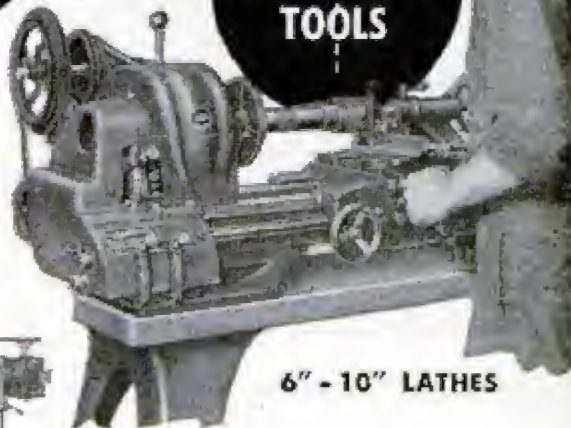
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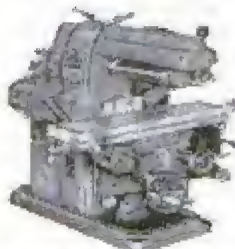
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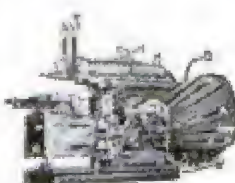
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finally left their rocketing craft and hit for shore. They made it just as the other boat hurtled past, flipped over and whirled in a shallow eddy where Jaskar and Swanda managed to beach it. But Robbins was picked up by the current and carried off. He came ashore several miles downstream after Herculean efforts.

For a week the men, all their supplies and guns gone, lived off the subarctic wilderness and a few items that had washed ashore after the upset—a can of powdered milk, baking powder, a sack of soaked flour, a can of dried eggs, a waterproof container of matches and a tarpaulin. One musette bag contained survey instruments and paper clips. From the latter, Jaskar fashioned fishhooks. They made rods of willow, leaders of bits of blasting wire Swanda had in a pocket, and line pulled from the tarpaulin. They swatted flies for bait. With this gear, they caught 74 fish during their sojourn in the wilderness.

Their distress signal was a series of driftwood poles in the form of an X, with an orange lifejacket placed at each tip. Cooking utensils came from gas and oil cans. They whittled ladles from crate wood and made forks from willow branches. Meanwhile, with their meager supply of instruments, they proceeded to survey near-by Vee Canyon for a dam site.

July 17 had been set as the date for helicopter search in case they hadn't come back. But no helicopter showed. Actually, two pilots of the famous Tenth Rescue Squadron had flown one in, sighted the abandoned boat on a beach and tried to land beside it. But they crashed. Two more men were lost in the wilds. Next day another Tenth Rescue C-47, looking for the lost helicopter, spotted both parties. Another helicopter went out and the entire group came back to civilization intact.

Later in the year, the same group went back to finish the job on Vee Canyon. This time, they went in by helicopter but once again cracked up on landing. They shot birds with their bear guns and lived on a cache of supplies they found in an old prospector's hut until once again they were rescued by helicopter. Dull? Hardly. And as a result of their persistence and courage, Vee Canyon has been proved a feasible site for a power dam which one day may be a key to opening the vast Alaskan wilderness. That's exploring today—the kind that pays off. By the way, the airmen of the Tenth Rescue Squadron have saved some 2000 lives in the past few years since Bernt Balchen organized that fabulous group.

(Continued to page 256)

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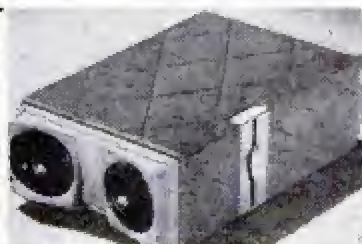
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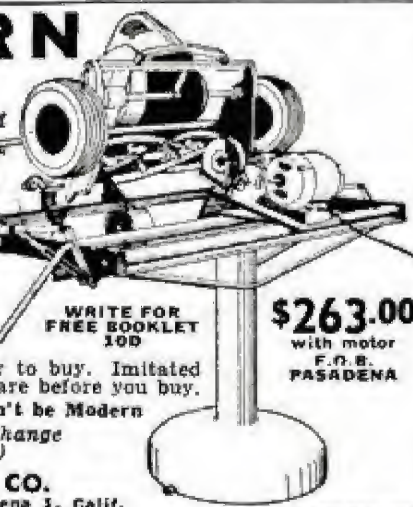
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PERHAPS one of the most exciting and mysterious regions of the world is Central Asia—that waste of deserts and mountains from Afghanistan and Tibet to the tundra and deserts of Mongolia and Siberia. Roy Chapman Andrews, a young American naturalist, first struck out into the Gobi Desert in 1916, jogging along on his camel with lines of Mongolian ponies bringing up the supplies. The wilderness was so vast, however, he decided on some swifter form of travel. Back in the States, he staggered the exploring world with the announcement that he was going back to follow up his prehistoric discoveries, and do it with automobiles! On all sides he was laughed at—impossible, they said. But young Doctor Andrews was not to be put off by the cynics. In Detroit he met the Dodge Brothers and unfolded his plans for a motor caravan. They liked the idea. Soon Andrews was back in the Gobi, bouncing along in his Dodges. Sure, some of the cars had flats, and others bogged down in the sands, but they were always hauled out. The gamble had paid off big and Andrews returned to America with one of this century's most sensational paleontological discoveries—giant eggs of the dinosaur! Since then automobiles have helped open vast unexplored areas of the world's deserts with those romantic names—the Gobi, the Takla Makhan, the Kalahari, the Sahara, the Atacama (over which I flew this past summer) and the Arabian (where I went with T. E. Lawrence and Emir Feisal some 36 years ago). Today it seems only a matter of time—and politics—before all these desert lands are completely explored.

Of all the historic parts of the world, Central Asia has always held more fascination for me than any other area. What lies behind the 20,000-foot Himalayan peaks? In the '20s I crossed Baluchistan and Waziristan, and thence to Afghanistan—the first time the Amir of the Afghans had ever allowed his country and people to be filmed. On that expedition Amanullah, King of Kabul and Light of the World, paraded his court and courtiers before our cameras.

It was not until the summer of 1949 that I was able to set out on the trip I had always dreamed of making—across the Himalayas to Tibet and then by caravan over the roof of the world to the capital of the Dalai Lama's hermit kingdom, the fabulous city of Lhasa. It seemed a chance in a million when permission came through for Lowell, Jr., and me to make the "forbidden journey." Again, of course, we had our cameras and were able to bring back a color film of those strange and mysterious people in a land where a fourth of all males

(Continued to page 258)

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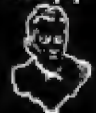
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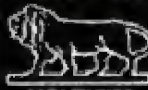
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are monks and lamas. We visited and photographed the Dalai Lama's palace—the Potala, nearly as high as the Empire State Building—and Drepung—largest monastery in the world, home of 10,000 monks—in a highly civilized country where there isn't a wheel, except a prayer wheel.

Although we covered well-trodden caravan trails across the 17,000-foot passes to the Forbidden City, one innovation we can lay claim to was the first use of radio recording. We sent back to CBS a complete account of our progress across the Himalayas and our near-tragic return journey to India—when my horse hurled me down onto a boulder and broke my hip in eight places, on a lofty and remote pass far from any medical aid.

The past 50 years have provided some of the most exciting adventure and mystery stories in the history of exploration. A perennial newspaper headline is the "Discovery of Colonel Fawcett." Endless travelers claim to have seen or heard of Fawcett alive in the wilds of South America—and I seem to have had a share of the stories on my broadcasts, too! In 1925, Col. Percy Fawcett, an Englishman, went into the jungles of Brazil's Matto Grosso to look for the ruins of a lost civilization.

During mapping expeditions in Bolivia, Peru and Brazil, Fawcett heard tales of a forgotten race of white Indians. Intrigued by the idea that these might be old Inca survivors of El Dorado, the mythical City of Gold, Fawcett persuaded the Royal Geographical Society in London to help him finance an expedition. On May 20, 1925, a report was sent by the expedition from deep in the Matto Grosso saying that they were heading into the Indian country beyond the Rio das Mortes—the River of Death. After that—no more. It was not until two years later that rumors began to circulate about the fate of Colonel Fawcett and his son. Rescue expeditions set out but the jungle never gave up the secret of the lost seekers of El Dorado. Last spring the Brazilian government proudly announced that it had cleared up the mystery by finding the bones of Colonel Fawcett. It now appears, however, that the jawbone was not that of the colonel, or so says his London dentist. Late in summer while in Brazil, I discussed this with South American explorers—two priests who had just walked in and flown out of the same unknown. It took them 80 days on foot to reach the nearest settlement where a plane could pick them up. They were still optimistic that the Fawcett mystery will be solved.

Much of the Amazon basin—that vast confusion of swamps and jungle where

(Continued to page 260)

"My Dad's smarter'n your Dad"



BETTY: He is not!

BILLY: He is too. How about that wrench your Dad bought last week? It's already broken—and today he had to borrow one from my Dad.

BETTY: What of it?

BILLY: Well, if he'd bought a *good* wrench, like the one *my* Dad has, it wouldn't be broken now.

BETTY: Oh, you think you're pretty smart, don't you?

I'm not saying *I'm* smart, but my Dad is. He says people who buy tools at bargain counters are just throwing money away. He gets all his tools at the hardware store, and he always looks for the brand name before he buys. He wouldn't even pay *one penny* for a wrench like your Dad bought—because there's no brand name on it.

Your Dad's smarter'n your Dad
Oh, you think you're pretty smart, don't you?



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huge anaconda snakes, electric eels, sting rays, alligators and flesh-eating piranha fish lie in wait for the unwary—is still largely a blank on our maps. Today, an Anglo-American expedition is high in the Andes of Peru searching for the source of the river.

No matter what happens to exploration, people will always debate the question, "Who got there first?" Right now there's a squabble in the making over the discovery of the Orinoco. Recently a party of French scientists led by a Venezuelan, a Doctor Cruxent, claimed to have reached the true headwaters after hacking their way through dense jungle and the gorges of the Sierra Parima. They were blazing a trail first sought in 1618 by Sir Walter Raleigh. Their claim came back by radio and the newspapers were full of the dramatic feat. But here's the twister. Another expedition, headed by an American, Dr. Herbert S. Dickey, now claims that they already had been there in 1931. Doctor Dickey, an entomologist, and one of my colleagues of the Explorers Club, says that he was hunting for natives to act as sculpture models and reached Tama Tama at the river's source in Brazil on July 28, 1931, more than 20 years ago. So now the barbed words will fly again.

PERHAPS our generation may be the last of terrestrial explorers, or nearly so. Already exploring is becoming three-dimensional—into the oceans, the skies, ice-caps and the bowels of the earth. We need scientific investigation of weather conditions, glaciology, more meteorology and an urgent search for more oil and rare minerals such as uranium. Though less than half the earth's surface actually has been surveyed, geographers using airplanes and helicopters will be able, fairly easily, to fill in the gaps in Africa and South America (regions over which I flew only recently) and in New Guinea, Arabia, Central Asia and Alaska. Then there is still two thirds of Antarctica that remains unseen by human eye. Modern equipment and techniques—the air drop, the helicopter, guided missiles, the bulldozer, wonder drugs, the jet plane—all provide help in key with the fast tempo of our time for the modern explorer, help undreamed of 50 years ago. Television, too, for already they are lowering a special TV-camera bathoscope into the nethermost depths of the ocean.

Further research into existing data is moving fast. One phase of this work is the idea under study by the armed services of using moving ice floes as landing fields on the Polar Ocean. This scheme was developed

(Continued to page 262)

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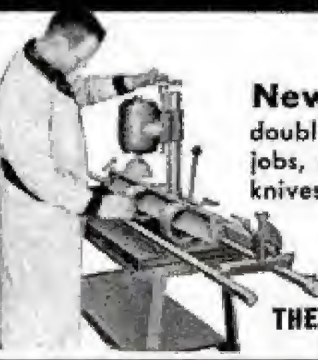
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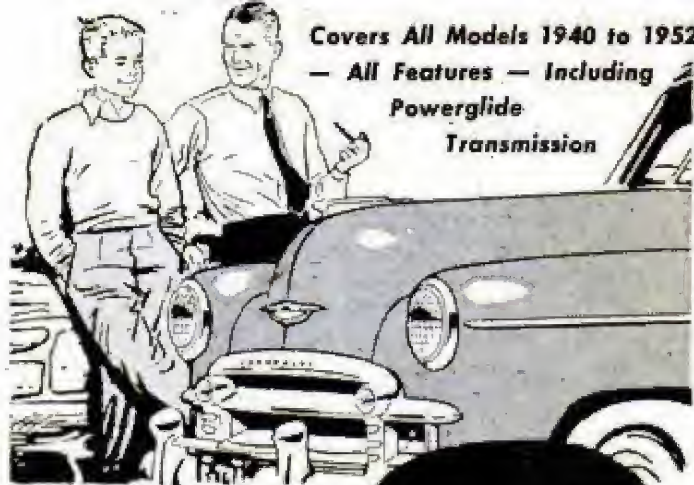
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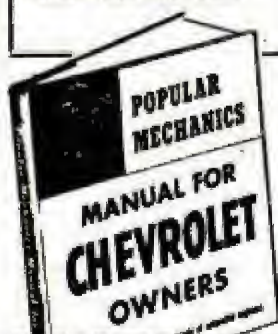
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at first by a Russian explorer, Ivan Papanin, who in 1937 set up a camp on the ice at the North Pole and subsequently drifted over a thousand miles on an ice floe before being rescued nine months later off the east coast of Greenland. Since then our own airmen have spent a great deal of time on the ice floes of the Polar Sea.

With all this speed of discovery, you may wonder what will be left to explore in 50 years. Plenty!

Since Plato told the story of a lost submerged continent, Atlantis, men have wondered about the mysteries of the mountains and valleys of the ocean. In spite of the great strides made in oceanographic work with echo-sounding and other electronic devices, we still have only the sketchiest knowledge of the topography of the ocean depths and of its inhabitants. Nearly three quarters of our planet is covered by water—dark, silent, at enormous pressure and undisturbed since the beginning of time.

As far as I know, only two men have ever entered this region of mystery—Dr. William Beebe and Otis Barton. Knowing that no diving suit could withstand the pressure a half mile down (over 1100 pounds to the square inch) Beebe and Barton designed a steel ball, known as a bathysphere, for their first descents off the Bermudian isle of Nonsuch where I visited Will Beebe and party. The bathysphere was built of 1½-inch steel with fused quartz windows and was equipped with a two-way telephone line and power lines for a searchlight. The question of air supply was solved by the use of oxygen tanks with chemicals to absorb the moisture and expended air. Manned by the two scientists, the steel globe was lowered to a depth of 3028 feet in the ocean off Bermuda and the searchlight was switched on. Before their eyes was revealed a parade of horrific and grotesquely shaped fish and crustaceans. Since then Barton designed a new sphere, the bathoscope, and in the summer of 1949 descended still farther, to 4500 feet in the Pacific off the coast of California. As Beebe summed it up after one of his dives: "The only other place comparable to these marvelous nether regions must surely be naked space itself, out far beyond the atmosphere—where the blackness of space, the shining planets, comets, suns and stars must really be closely akin to the world of life as it appears to the eyes of an awed human being, in the open ocean, one half mile down."

To the reader of 1900, the idea of a visit to the moon was just a Wellsian fantasy, but much that Jules Verne and Wells predicted is now history. *Around the World*

(Continued to page 264)

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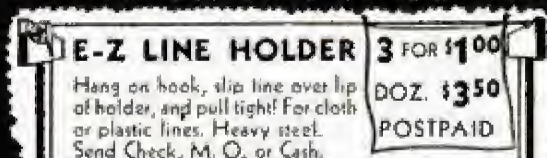
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in *Eighty Days* has been reduced to "Around the World in Less than Eight Days." Already scientists are talking seriously about trips to the moon, and even to Mars and Venus, aboard atomic-powered rocket ships. Outer-space exploration may well be the big field for tomorrow's young scientists. Today we are preparing the way for it.

At the Air Force School of Aviation Medicine in San Antonio, Tex., regular symposiums on space medicine are dealing with the problems man will meet. The earth's atmosphere is a cushion protecting man from the terrific temperature variations of outer space, from meteors, and from ultraviolet, cosmic and X rays. To leave this cozy earth will be as hard for mankind as it was for the first prehistoric fish to flop out of water and survive on dry land.

It's doubtful that man's body will change to meet the climates and hazards of outer space, so he'll have to take his environment with him—in a capsule. Even living in a capsule, he'll have trouble. At the high getaway speeds needed for space travel, friction of the air on the skin of a rocket ship, scientists know, will encase the craft in a film of 1000-degree temperature for the first 30 miles. So they're devising refrigeration units—like those used on jet fighters—to counteract it. One suggestion is to use frigid liquid oxygen as a coolant.

Everyone knows about the problem of weight when a space-exploration crew some day leaves the earth's gravitational field. In the science-fiction movies, rocket crews bounce around gaily, using their newfound weightlessness for incredible feats of bravery. In real life, it won't be funny. The first space explorers will find it a stumbling, clumsy nuisance. It will take plenty of practice before they can make their arms, legs and bodies function sensibly.

Air is another hazard. Where will they get it? To bring in the thinly scattered gas particles of outer space and compress them to a breathable consistency is one suggestion. But at a mere 100,000 feet, there's enough pure ozone floating around to poison a whole space crew in no time. Bottled air probably will be the answer, according to space scientists.

Biggest dangers are the mysterious rays of space. Vulnerable crews will have to be shielded from ultraviolet and X rays from the sun. Even at the heights we reached in the Himalayas, the ultraviolet rays gave us trouble. Still more of a potential danger are the cosmic rays, consisting of many heavy particles or whole atoms, traveling with fantastic speed and unleashing vast

(Continued to page 266)

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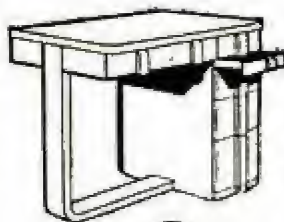
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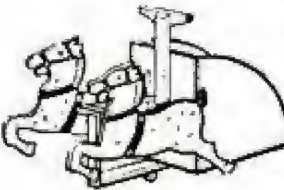
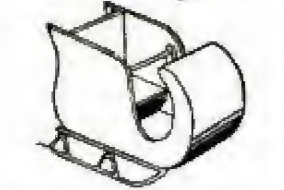
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amounts of energy. No one knows their origin, but it's somewhere far in the outer reaches of space. The earth's atmosphere slows them so that few cosmic rays ever reach our planet and those that do are spent. But up there in space, they'll riddle every part of a human body in a flash unless the space planners can find a new armor that will stop them.

In any event, the future of such inter-planetary exploration for the present seems to be safe in the hands of scientists, engineers and airmen. There will be time enough to argue such plebian questions as "Who owns space?" when the basic problems are solved.

Until then, there will be plenty of work for explorers right here on our tiny piece of space. In spite of the fact that few "white spots" are left to plant a flag on, we keep finding new things in our own uncharted wildernesses.

Last year alone, scores of expeditions came back with libraries of new knowledge. On the Caspian Sea in Iran, the bones of three Stone Age persons were found in a cave where the roof dropped on them 75,000 years ago. In Iraq, busy archeologists uncovered a 7000-year-old town, oldest known to exist, even older than Ur of the Chaldees. Its age was pin-pointed by radioactive-carbon measurement, an atomic-age measuring boon to scientists that is revolutionizing this kind of work.

Across the burning sands of Arabia's Rub Al Khali desert, explorers are talking of what they think may have been the Queen of Sheba's ancient city—a ruined city of alabaster temples and palaces in the desert sands of Mareb, in Yemen.

Exploring scientists also learned that the huge Chubb crater in northern Quebec is the biggest hole ever left by a meteor.

Surprises keep turning up. On a previously unexplored island near Bermuda, ornithologists found living cahows—ocean birds believed extinct for 300 years. Oceanographers discovered undersea mountains 11,000 feet high near the Orkney Islands. They also found life existing six miles under the sea in the Johnson Deep off the Philippines.

We could go on for pages just naming the exploration feats of 1951. And the chances are that when the year 2000 rolls around, we still will only have scratched the surface of Mother Earth's secrets. No matter what happens, there will always be room for good scientific explorers—men whose curiosity about this world in which we dwell won't let them sit by the fireside any longer than it takes to tell the folks back home about their last trek "beyond the utmost purple rim." ★ ★ ★



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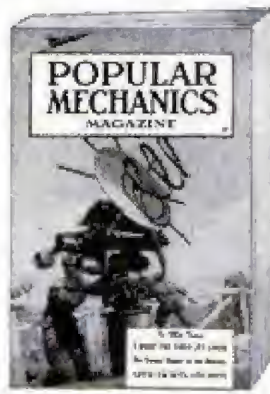
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Look for it in the September issue

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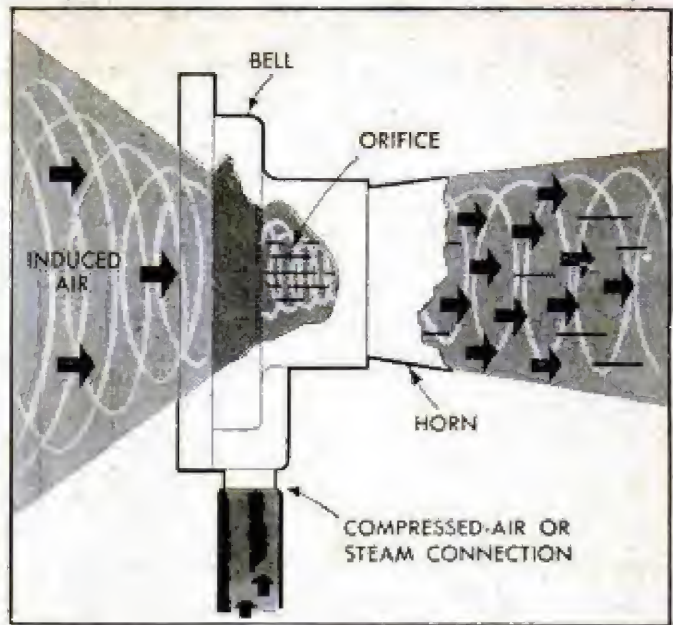
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All the functions of a slide rule are built into a new two-color mechanical pencil. Various scales for the slide rule are printed around the pencil, and a calibrated transparent tube is slipped along the pencil to find the desired information. The pocket clip serves as a magnifying lens to aid in reading the scale. The pencil also serves as a handy depth gauge.

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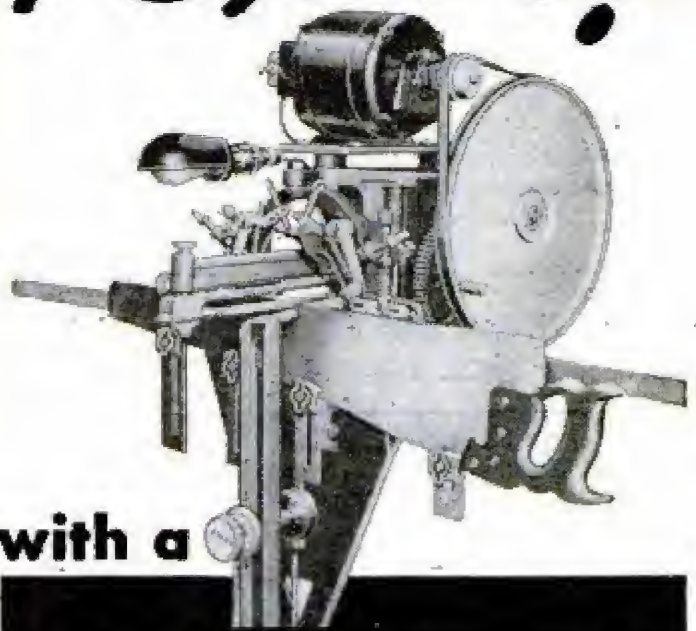
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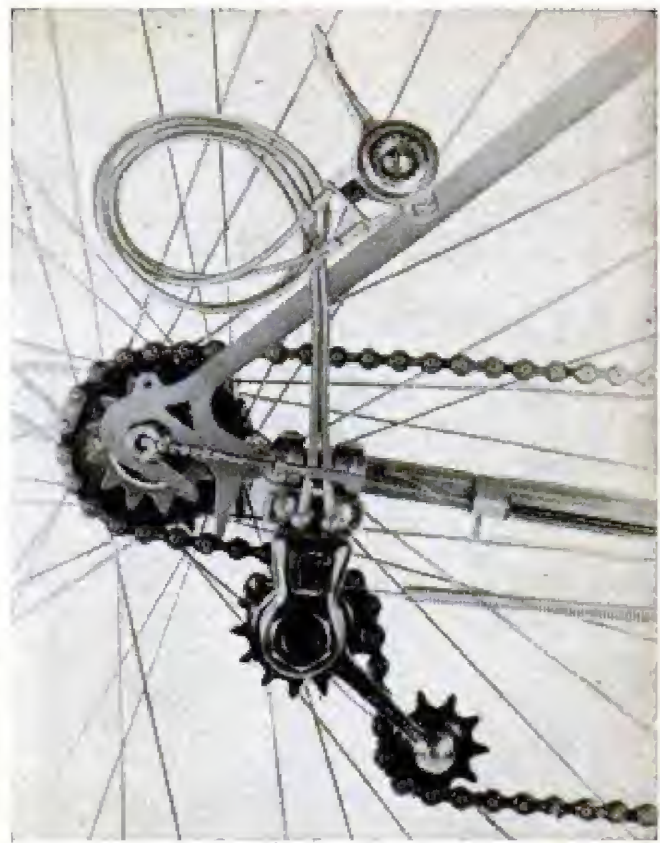
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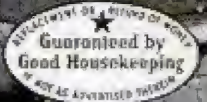
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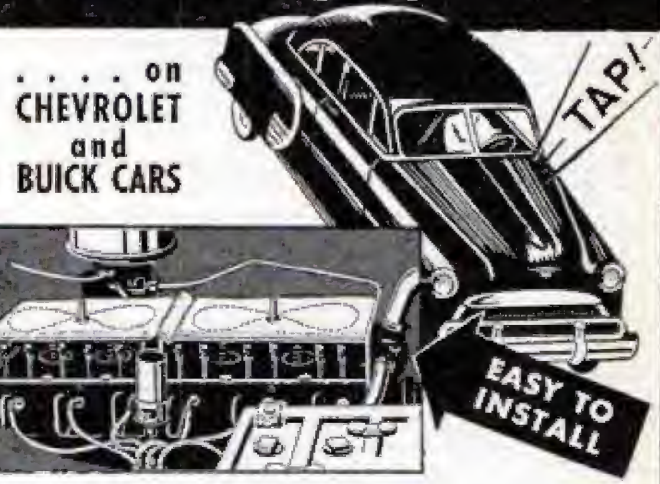
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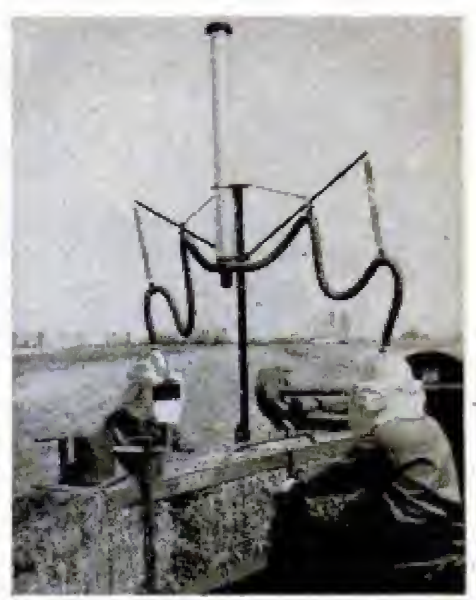
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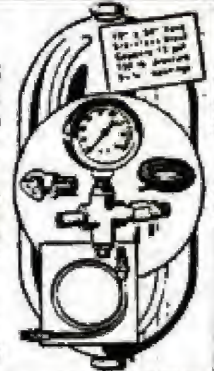
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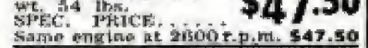
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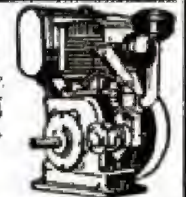
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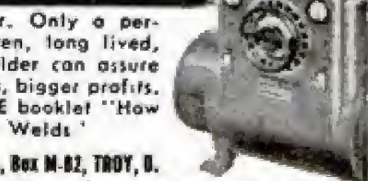
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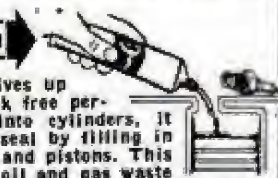
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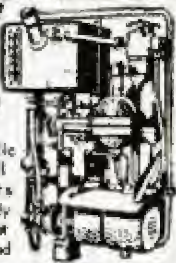
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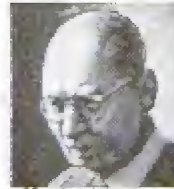
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